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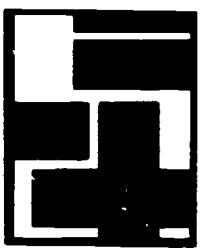
ABSTRACT

This curriculum guide lists mathematics topics and concepts, learning outcomes, and sample learning objectives (in three columns) for grades 1 to 8. Topics/concepts, in the first column, describe the major parts of the subject under consideration. They define broadly the content to be included in the study of each subject area. Learning outcomes, in the second column, describe, in general terms, the behaviors students are expected to demonstrate as a result of their learning experiences. These outcomes are the goals toward which student learning is directed. Sample learning objectives, shown in the third column, are indicators of student progress toward the stated goals. At least one sample learning objective is stated for each learning outcome. Included in an appendix is a table showing the grade-level placement for these topic areas (which are listed under the topics/concepts column): sets; whole numbers (counting and numeration); whole numbers (operations); fractions and decimals; fraction operations; measurement and estimation; geometry; math sentences; probability and statistics; graphs and scale drawings; problem-solving; calculators and computers; integers; and ratio, percent, and proportion. (JN)

ELEMENTARY MATHEMATICS

ALASKA CURRICULUM GUIDE

First Edition



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Alaska Department of Education

August 1985

ELEMENTARY MATHEMATICS

TABLE OF CONTENTS

"Some measure of genius is the rightful inheritance of every person."

Alfred North Whitehead

PREFACE TO THE SERIES

Among the many decisions that schools must make, none is more important than the choice of curriculum. Curriculum defines the intent behind instruction and the expectations for student performance. This first field edition curriculum guide is one of a series intended to serve as a model to aid school districts as they develop and review their own curriculum documents. It is not intended that any of these field edition guides be used directly by teachers for instructional purposes. Districts are expected to develop their own locally suitable curriculum based on these guides. Districts have or are developing their own locally suitable curriculum using these guides as a base and point of departure. In the future as schools use this material to plan and implement programs, its value will be measured by the increased abilities of students to learn, think, and perform as informed and productive citizens.

In their present form these guides represent a synthesis of input from many sources, both Alaskan and national. They were originally prepared by staff at the Department of Education with the help of professional content associations, Alaskan teachers and administrators. An extensive review and revision process was conducted in 1984-85. School districts, subject matter associations, other professional associations, and interested individuals provided input to a revision process that was contracted to the Northwest Regional Educational Laboratory. A panel of nationally recognized curriculum specialists assisted in the review of each content area. contributors to specific guides are listed in the acknowledgements sections of those guides. In

one sense, these guides will never be finished. It is the intention of the Department of Education that they be dynamic documents subject to revision every few years as part of the six year curriculum review cycle that was recently initiated by new curriculum regulations. Guides exist in the areas of:

Kindergarten	Fine Arts
Language Arts	Social Studies
Science	Computer Education
Foreign Languages (Secondary)	Health
Mathematics	Physical Education

The format of the guides is straightforward but not oversimplified. Each guide lists topics/concepts, learning outcomes, and sample learning objectives in three columns. (In the case of Secondary Foreign Language, the first column is headed topics/skills.)

Topics/concepts, in the first column, describe the major parts of the subject under consideration. They define broadly the content to be included in the study of each subject area.

Learning outcomes, in the second column, describe, in general terms, the behaviors students are expected to demonstrate as a result of their learning experiences. Learning outcomes are the goals toward which student learning is directed.

Sample learning objectives, shown in the third column, are indicators of student progress toward the stated goals, i.e., the learning outcomes. At least one sample learning objective is stated for each learning outcome. It is intended that the sample learning objectives are just that: samples only. They do not constitute a learning program. School districts generate their own locally applicable learning objectives within the framework of their district topics/concepts and learning outcomes.

The guides are grouped by grade level groupings (except Mathematics) -- grades 1-3, 4-6, 7-8 for the elementary level, and 9-12 for the secondary level. Mathematics is presented sequentially grade by grade. Recognizing the unique characteristics of the five year old learner, Kindergarten was prepared as a separate guide. In the development, grades 7-8 were generally seen as the end of the elementary years, but with some beginnings for the secondary level. On the secondary level the guides generally contain discrete courses that would be offered; these are not always tied to a particular grade level as the local district must determine the most effective sequence for those courses.

The Alaska State Board of Education stated, "The Model Curriculum Guides are intended to serve as a model, not a mandate." They underscored the fact that a partnership between state and local school districts is crucial. We seek to promote individual variation while stressing the collective responsibility for educating all students in Alaska. It is in this spirit that the Department of Education welcomes the opportunity for continuous collaboration with those interested in the further development and refinement of this entire series of guides.

PREFACE TO

ELEMENTARY MATHEMATICS CURRICULUM GUIDE

The major goal of the Alaska Mathematics Curriculum Guide for elementary students in grades 1-8 is to provide a set of related and specific goals, instructional objectives and choice of essential subject matter. This is done through an exemplary model that incorporates the clearest and most viable ideas about mathematics and the teaching of mathematics.

Specific goals of the Alaska Elementary Mathematics Curriculum Guide have been developed to help young people do the following:

1. Use the language and symbolism of sets, set operations and their properties.
2. Use the principles of inductive and deductive logic.
3. Measure things using specific units of measure.
4. Use the symbols, elements, operations and functions of whole numbers, integers, rational numbers, real numbers and when appropriate, complex numbers and finite and infinite systems.
5. Solve open sentences.
6. Solve problems using graphs, tables and mathematical statements.
7. Use problem identification, analysis, organization, evaluation, application and generalization to solve real and everyday problems.
8. Value the development of mathematical skills and knowledge.
9. Solve practical problems using mathematical sentences or models and interpret the solution in the context of the problem.

10. Use geometric definitions, postulates and theorems to solve problems.

11. Compute using numbers and algebraic expressions.

12. Describe the importance of counting, measuring, mathematical symbols and systems to historical and cultural development.

13. Use probability and statistics to solve problems.

14. Use calculators, computers, slide rules and other support technology to solve problems.

The curriculum guide offers examples of how these skills can be demonstrated within the learning environment: it is expected that local districts will consider the outcomes and objectives in light of their own curricular goals and educational program.

ACKNOWLEDGEMENTS

In preparing the Model Curriculum Guides, the Department of Education requested and received copies of curriculum materials from school districts in Alaska, the state's own Centralized Correspondence Study and other state departments of education. The department thanks the following school districts and state departments for submitting materials:

Alaska School Districts

Adak
Anchorage
Annette Island
Bristol Bay
Copper River
Cordova
Craig
Delta/Greely
Fairbanks
Galena
Haines
Iditarod
Kenai Peninsula
Ketchikan
Klawock
Lower Kuskokwim
Lower Yukon
Matanuska-Susitna
Nenana
Nome
North Slope
Northwest Arctic
Pelican
Railbelt
Valdez
Yakutat

State Departments of Education

Alabama
Arizona
Arkansas
California
Connecticut
Delaware
Florida
Idaho
Illinois
Indiana
Maine
Minnesota
Maryland
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New York
North Carolina
Oregon
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South Dakota
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Texas
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Vermont
Virginia
West Virginia
Virgin Islands
Guam

The department appreciates the efforts of its staff who reviewed and synthesized specific content area materials which resulted in this draft Model Curriculum Guide. Contributors in elementary mathematics included:

Raymond Coxe
Margaret MacKinnon
Brian Rae

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Margaret MacKinnon, C.C.S.

The Northwest Laboratory's chief writer for this Elementary Mathematics Guide was Leslie Crohn. Dr. Shirley A. Hill, University of Missouri, Kansas City, was chief consultant to this NWREL team. Dr. Dana Davidson was consultant on matters of child development. Project design and management was by Dr. William G. Savard of NWREL's Assessment and Evaluation Program. Dr. Gary Estes provided overall direction.

Special thanks are due to Gloria Lerma and Andrea Levy for their cheerful and seemingly endless typing and management of details.

ELEMENTARY MATH
GRADE 1

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner will:	The Learner will:
SETS	Understand set attributes, equivalency and number.	
		Tell which things are members of a set and which things are not, given a picture of a set.
		Demonstrate a one-to-one matching between members of two equivalent sets.
		Identify sets as equivalent or nonequivalent; tell which set has fewer and which set has more members.
		Describe a set with no members, such as a set of elephants in the classroom.
		Identify a subset of a given set.
		Count and name the numbers of a given set.
		Identify 0 as the number associated with the set with no members (empty set).
WHOLE NUMBERS - COUNTING	Understand concepts related to counting, reading and writing numbers 0-99.	
		Identify the numbers which immediately precede and follow a given number.
		Arrange ten nonequivalent sets in order of cardinal size.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING (Cont.)		
		Recite the first 100 counting numbers in proper order.
		Identify and read numerals for whole numbers 0-99.
		Read and write number words one through ten.
		Order numbers such as 47 and 95 by saying, "47 is less than 95".
	Know the ordinal numbers first through tenth.	
		Identify the position of objects or events using first through tenth positions.
	Know place value of two-digit numerals.	
		Identify the numerals in the ones place and numerals in the tens place, given a list of two-digit numerals.
	Understand the concept of odd and even numbers.	
		Identify and name odd and even numbers.

ELEMENTARY MATH
GRADE 1

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS	Understand addition and subtraction facts with sums through 18.	
		Construct sets, combine and remove subsets to determine sums and differences.
		Demonstrate addition and subtraction by using sets or a number line.
		Name the sum or difference of an addition or subtraction fact through sums of 18.
	Understand column addition and subtraction with no regrouping.	
		Find the sums and differences for problems with two-digit numerals that do not require regrouping.
	Understand the commutative property of addition (the sum of two numbers is not affected by reversing their order).	
		Use sets or a number line to demonstrate the commutative property of addition.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
	Understand the associative property of addition (the sum of three numbers is independent of the way in which the numbers are grouped or paired for adding).	
		Use sets or a number line to demonstrate the associative property of addition.
	Understand the identity element for addition (the number which does not change the value when the operation of addition is performed; for addition, this number is 0).	
		Use sets or a number line to demonstrate the identity element for addition.
	Know how to solve simple word problems.	
		Solve simple oral or written one-step word problems involving addition and subtraction of one-digit numbers.
FRACTIONS		
	Understand the fractions 1/2, 1/3, and 1/4.	
		Identify and name the fractions 1/2, 1/3 and 1/4, given models.
		Construct models for 1/2, 1/3, and 1/4.

ELEMENTARY MATH
GRADE 1

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MEASUREMENT AND ESTIMATION		
	Understand appropriate uses for basic units of measure.	
		Measure an object by counting the number of units needed to match the length of the object, using counters such as sticks or tongue depressors.
		Compare the lengths of various objects in the room by estimation, and then by matching to measure which is longer, and which is shorter.
		Weigh a set of objects and identify the heaviest and lightest, using a scale.
		Measure distances and heights using nonstandard units of measure.
		Answer questions such as the following: "How can you tell if it is warmer inside or outside the classroom?".
	Know how to tell time and count money.	
		Tell time on the hour.
		Name the months of the year.
		Name the days of the week.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MEASUREMENT AND ESTIMATION (Cont.)		Identify and name pennies, nickels and dimes and tell the value of each coin in cents. Select coins needed to solve simple word problems related to money.
GEOMETRY	Understand relative position, size and names of basic geometric shapes.	Identify objects as in front of, behind, below, on or above other objects. Identify objects that are inside, outside, or are a boundary of other objects. Identify objects as larger, smaller or about the same size as other objects. Distinguish among basic geometric figures. Name basic geometric figures. Classify models or figures with rounded and straight sides into two groups. Identify and name edges, corners and faces of objects.

ELEMENTARY MATH
GRADE 1

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
GEOMETRY (Cont.)		Draw basic geometric figures.
PROBABILITY AND STATISTICS		
	Understand data gathering and simple graphs.	
		Collect, organize and graph a variety of data related to personal experiences, and preferences.
		Tally information in games and classroom activities.
		Use blocks and pictographs to record information.
	Understand chance and probability.	
		Discuss situations which involve the likelihood of events happening.
		Predict and record the outcomes of coin tossing.
PROBLEM SOLVING		
	Understand simple patterns.	
		Recognize a pattern; describe and extend it.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
PROBLEM SOLVING (Cont.)		Estimate or guess a solution to a given problem and test the solution for accuracy.
CALCULATORS AND COMPUTERS	Use a computer as a learning tool. (See also Computer Education Curriculum Guide.)	Play computer mathematics games.

ELEMENTARY MATH
GRADE 2

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
SETS	Understand one-to-one correspondence, set equivalency, empty set, subsets and set union.	
		Demonstrate one-to-one matching between members of two equivalent sets in more than one way.
		Identify two sets as equivalent or nonequivalent; tell which set has more and which set has fewer members; write number sentences to describe the sets.
		Describe and generate a set which has no members.
		Identify a subset of a set.
		Remove a subset from a given set of elements and get a remaining subset.
		Associate a numeral with a set that names the number of elements in the set.
WHOLE NUMBERS - COUNTING	Understand concepts related to counting, reading and writing numbers 0-99.	
		Identify the numbers which immediately follow and precede a given number.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING (Cont.)		
		Count by 2s and 5s to 100.
		Count by 100s to 1,000.
		Identify, read and write numerals for whole numbers 0-99.
	Know cardinal numbers 0-100.	
		Group the members of a given set by ones, twos, fives, and tens by counting how many members are in the set.
		Identify, name, read and write numerals 0-999.
		Read and write number words through twenty.
		Compare two whole numbers, each less than 1,000, by telling which is greater or less than the other.
		Write whole numbers in order from least to greatest and from greatest to least.
	Know the ordinal numbers first through twentieth.	
		Identify the position of objects or events using first through twentieth positions.
	Understand place value.	

ELEMENTARY MATH
GRADE 2

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING (Cont.)		
		Identify the numerals in the ones, tens and hundreds places, given a list of three-digit numerals.
		Write the expanded version of a given numeral, 0-1000.
	Understand the concept of odd and even numbers.	
		Identify and name odd and even numbers, 0-1000.
WHOLE NUMBERS - OPERATIONS		
	Know how to add and subtract whole numbers.	
		Solve an addition or subtraction problem using sets on a number line and name the sum or difference of the numbers.
		Write two addition and two subtraction facts to describe a set.
		Name, using immediate recall, the sum or difference of an addition or subtraction fact through sums of 18.
		Name, using immediate recall, sums and differences in problems written in both horizontal and vertical notation.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
	Understand column addition and subtraction of three-digit numerals.	
		Name the sums and differences for problems with three-digit numerals.
	Know how to use regrouping to solve problems.	
		Name the sums and differences for problems with two-digits using regrouping.
	Understand the commutative property of addition (the sum of two numbers is not affected by reversing their order).	
		Write addition equations to describe the commutative property.
	Understand the associative property of addition (the sum of three numbers is independent of the way in which the numbers are grouped or paired for addition).	
		Write and solve an addition equation using the associative property.

ELEMENTARY MATH
GRADE 2

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
	Understand the identity element for addition (the number which does not change the value when the operation of addition is performed; for addition, this number is 0).	
		Solve equations using the identity element.
FRACTIONS AND DECIMALS		
	Know how to read and write the fractional numeral.	
		Identify, name, read and write a numeral for the fraction that is represented by a physical model.
		Identify and represent halves, thirds, fourths and tenths by parts of sets and on a number line.
MEASUREMENT AND ESTIMATION		
	Understand appropriate uses for basic units of measure. (See also Science Curriculum Guide.)	
		Measure an object, using a suitable unit of length, by counting the number of units needed to r tch the length of the object.
		Use appropriate terms of measurement.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MEASUREMENT AND ESTIMATION (Cont.)		
		Measure a line segment to the nearest whole unit.
		Measure and compare the capacity of a container to the nearest whole unit.
		Determine which of two objects is heavier, using a simple balance.
		Give the weight of an object using a simple scale.
		Record temperatures inside and outside the classroom.
		Determine if the temperature is warmer or cooler than the previous day.
	Know how to estimate.	
		Estimate length within reasonable limits.
	Know how to tell time and count money.	
		Tell time on the hour and half hour.
		Tell time in terms of days, weeks and months.
		Interpret a calendar.

ELEMENTARY MATH
GRADE 2

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MEASUREMENT AND ESTIMATION (Cont.)		
		Tell the value of a set of coins in cent notation.
		Tell if a set of coins (values to $1.00) is enough to purchase a given object.
		Name pennies, nickels, dimes and quarters and state the value of each coin in cents.
		Solve simple addition or subtraction money problems for amounts up to $1.00.
		Determine what foods to buy for a meal and how much the foods cost given a grocery advertisement and play money.
GEOMETRY	Understand basic geometric shapes.	
		Identify and name circles, triangles, line segments and number lines.
		Identify and name cylinders and cones.
		Group a set of objects containing balls, boxes and cylindrical-shaped objects according to shapes and tell which attributes were used.
		Describe a line segment or curve as a set of points.
		Describe a straight line as a set of points with no beginning and no end.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
GEOMETRY (Cont.)		Describe a simple curve as one that does not cross itself.
		Identify and name closed and open simple curves.
		Identify the inside and outside of simple closed figures.
		Select figures which are congruent.
		Draw models of line segments which are congruent to the original model.
		Draw a square, rectangle and triangle using a straightedge.
		Draw a number line and label whole number points, using a ruler.
		Draw a line segment of given length using a ruler.
MATH SENTENCES	Understand math sentences. (See also Language Arts Curriculum Guide.)	
		Write an open sentence which models a story problem and find the solution set for it.

ELEMENTARY MATH
GRADE 2

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
PROBABILITY AND STATISTICS		
	Understand data gathering and simple graphs.	
		Arrange collected data in tables and illustrate the data with bar graphs.
		Interpret a simple bar graph or pictograph.
		Explain how to tally information in games and other classroom situations.
		Play probability games and describe the results.
GRAPHS AND SCALE DRAWINGS	Know how to read a map. (See also Elementary Social Studies Curriculum Guide.)	
		Make a simple map with miles indicated between towns or villages.
		Make up word problems to find the shortest route, how far from one place to another, etc.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
PROBLEM SOLVING	Know how to solve problems.	
		Complete a pattern of shapes in a drawing.
		Group objects based on common attributes.
		Complete a simple number pattern.
	Know how to make math sentences to describe problem solving situations. (See also Language Arts Curriculum Guide.)	
		Solve a number sentence for a one-step story problem.
		Choose the appropriate operation (addition or subtraction) to solve a number sentence which describes an illustration.
	Know how to use estimation for solving problems.	
		Use estimation or "guess and check" techniques to solve measurement problems.
CALCULATORS AND COMPUTERS	Use a computer to solve problems. (See also Computer Education Curriculum Guide.)	
		Use a computer to solve problems involving sets.

ELEMENTARY MATH
GRADE 3

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
SETS	Understand set concepts and basic principles of sets.	
		Explain how to use clearly defined attributes to distinguish between members of a set and things which are not members.
		Demonstrate the equivalency of two sets by comparing the cardinal numbers of each.
		Tell how many more or how many fewer members in nonequivalent sets.
		Identify subsets of sets.
		Remove a subset of elements from a given set and get another subset.
WHOLE NUMBERS - COUNTING AND NUMERATION	Understand concepts related to counting, reading, writing and recognizing numbers.	
		Identify the numbers which precede and follow a given number, 0-10,000.
		Read and write number words through nine hundred and ninety-nine.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION (Cont.)		
	Understand the order relationships between large numbers.	
		Write a set of whole numbers in order from least to greatest and from greatest to least.
		Write the symbols, >, < to express the relationship between two given numbers.
	Understand ordinal numbers beyond twentieth.	
		Identify the position of a particular object or event, using more than 20 objects or events.
	Understand place value up to four digits.	
		Identify and name the numerals in ones, tens, hundreds and thousands places, given a list of four-digit numerals.
		Write the expanded version of a four-digit numeral.

ELEMENTARY MATH
GRADE 3

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION (Cont.)	Know Roman numerals through XV.	Write the Roman numerals for numbers less than 15. Write the Arabic numbers for Roman numerals less than XV.
	Understand the concept of odd and even numbers.	Identify and name odd and even numbers to 10,000.
WHOLE NUMBERS - OPERATIONS	Know how to add and subtract whole numbers using standard algorithms in both regrouping and nonregrouping situations.	Write the two related subtraction equations of an addition equation. Check subtraction problems using addition.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
		Name the sums and differences for problems (four-digit numerals) without regrouping.
		Identify and name sums, differences, missing addends and missing operational signs in problems written in both horizontal and vertical notation.
		Use mental arithmetic to compute sums and differences less than 100.
	Understand the commutative property of addition (the sum of two numbers is not affected by reversing their order).	
		Solve equations with sums to 10,000 using the commutative property.
	Understand the associative property of addition (the sum of three numbers is independent of the way in which the numbers are grouped or paired for addition).	
		Indicate the grouping of addends which will make the addition easiest for a given problem.

ELEMENTARY MATH
GRADE 3

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner will:	The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
	Understand the identity element for addition (the number which does not change the value when the operation of addition is performed; for addition, this number is 0).	
		Solve equations using the identity element.
	Understand multiplication and division of whole numbers and their related properties.	
		Use pictures or objects to show the combination of sets; determine and name the product of the numbers.
		Divide a set of objects into equivalent subsets; name how many subsets can be formed.
		Design a simple experiment involving set partition to determine and name the quotient of a division problem.
		Demonstrate inverse relation of multiplication to division.
		Identify and name products and quotients in problems written in both horizontal and vertical notation.

ELEMENTARY MATH
GRADE 3

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
		Solve equations using the associative property of multiplication to simplify computations.
	Understand the identity element for multiplication (the number which does not change the value when the operation of multiplication is performed; for multiplication, this number is 1).	
		Solve equations using the identity element for multiplication.
	Understand the multiplication property of zero.	
		Solve equations using the property of zero.
	Understand the distributive property of multiplication over addition (the number to be multiplied can be renamed and the operation can then be performed in two steps: for example, 2x32=2x(30+2)=(2x30)+(2x2)).	
		Demonstrate the distributive property by using sets.
	Know how to solve word problems.	

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		Solve one-step word problems involving multiplication of a one- or two-digit number by a one-digit number.
FRACTIONS AND DECIMALS	Know how to read and write fractional numbers and equivalent fractions.	Identify, name, read and write a numeral associated with the model of a fraction with a denominator less than 12.
		Construct and identify models for fractions with denominators 2-12.
		Determine whether two fractions are equivalent by using sets or pictures.
		Identify fractions that are equivalent to one, using concrete objects or models.
		Write the symbols =, $<$, $>$, to express the relationship between two fractions having the same denominators.
	Understand fraction operations.	Add and subtract fractions with like denominators.
		Determine and name the sum of two fractions with the same denominators (less than 12).

ELEMENTARY MATH
GRADE 3

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MEASUREMENT AND ESTIMATION	Know how to measure using units of length, time, money, capacity, temperature, perimeter, area and weight.	Select a suitable unit and count to measure the length of the object. Tell time to the nearest minute. Measure time in terms of days, weeks, months and years. Name and state the value of all U.S. coins and bills. Determine the total value in decimal notation of pictures of coins and bills of different denominations. Measure the length of an object to the nearest half unit (inch, foot, yard, centimeter, meter). Find the perimeter of a figure by measuring the length of its sides. Determine the area of a given region by counting the number of square units needed to cover the region.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MEASUREMENT AND ESTIMATION (Cont.)		
		Determine the volume of a given rectangular space by counting the number of cubic units needed to fill the space.
		Measure the surface of a rectangle.
		Measure and compare capacity (volume).
		Determine which of two objects is heavier, using a balance.
		Determine the weight of a given object using a scale.
		Record inside and outside temperatures using a thermometer; identify freezing point and boiling point. (See also Science Curriculum Guide.)
		Use terms, abbreviations and symbols for units of measurement.
		Estimate length and weight using standard units, within reasonable margins of error.
	Know how to express relationships between units of measure.	
		Rename a measure in other units within the same system.

ELEMENTARY MATH
GRADE 3

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner will:	The Learner will:
GEOMETRY	Know how to identify simple plane geometric and space figures.	
		Identify and name two-dimensional geometric figures.
		Identify and name cubes, spheres, cylinders and cones.
		Find examples of lines that appear to be parallel, such as railroad tracks, telephone lines, or lines on a paper.
	Understand congruency.	
		Match angles to determine which are congruent.
	Understand symmetry.	
		Choose figures which possess line symmetry.
	Understand similarity.	
		Identify squares and triangles that possess similarity.
MATH SENTENCES	Know how to write and solve math sentences.	

67

68

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MATH SENTENCES (Cont.)		
		Solve open sentences using the addition facts for whole numbers with sums less than or equal to 999.
		Use $<$, $>$, $=$, $\neq$, to make true number sentences.
		Classify types of sentences as open, true or false; correct or answer the false and open sentences.
PROBABILITY AND STATISTICS		
	Understand data gathering and simple graphs.	
		Construct a bar graph.
		Interpret a bar, circle and picture graph and identify which quantities in each graph are larger or smaller.
	Understand simple probability.	
		Predict the outcomes of experiments, perform the experiments and compare results with predictions.
	Understand simple permutations.	
		Count the number of possible arrangements within a set, using concrete objects; record the arrangements.

ELEMENTARY MATH
GRADE 3

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
GRAPHS AND SCALE DRAWINGS	Know how to read and make graphs and charts.	
		Make a chart to keep a record of daily weather.
		Make a chart or graph to keep a record of achievement in some area.
	Know how to make and read maps. (See also Social Studies Curriculum Guide.)	
		Use introductory computer graphics programs such as Deer, Drawing, MECC pictures and LOGO. (See also Computer Education Curriculum Guide.)
		Draw a map of an imaginary town, including a scale; measure the distance between various locations.
PROBLEM SOLVING		
	Know how to use patterns and sequences to solve problems.	
		Continue a pattern of numbers, subtractive or additive, in increments of five or less.

71

72

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
PROBLEM SOLVING (Cont.)		
	Know how to use diagrams as an aid to problem solving.	
		Interpret and find solutions for word and picture problems.
	Know how to use estimation and "guess and check" methods for solving problems.	
		Estimate answers in problem solving and computation problems.
		Estimate or guess a solution to a problem and test that solution.
	Know how to restate a problem.	
		Restate a problem in his or her own words.
		Make up a word problem using everyday situations. (See also Language Arts Curriculum Guide.)
	Know how to formulate math statements to describe problem situations.	
		Find an answer to a problem by simplifying an expression or formulating a math statement.

ELEMENTARY MATH
GRADE 3

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
CALCULATORS AND COMPUTERS	Know how to use simple calculating devices. (See also Computer Education Curriculum Guide.)	
		Use a hand calculator to add or subtract.
	Know how to use the computer to solve problems.	
		Use programming readiness programs such as Face Maker, Creature Creator and Muggles.

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner will:	The Learner will:
SETS		
	Understand set concepts and basic principles of sets.	
		Join two or more sets and get a third set.
		Remove a subset from a given set of elements and get a remaining subset; write the number sentence that describes this process.
WHOLE NUMBERS - COUNTING AND NUMERATION		
	Understand concepts related to counting, reading, writing and recognizing numbers and their order.	
		Identify, name, read and write five or more different names for the same number.
		Identify, name, read and write numerals for whole numbers, 0-100,000.
		Order a set of whole numbers from largest to smallest or from smallest to largest.
		Identify a number as cardinal or ordinal.
	Understand place value to six digits.	
		Identify and name the values of digits that are in ones, hundreds, thousands, ten-thousands and hundred-thousands places given a list of six-digit numerals.

ELEMENTARY MATH
GRADE 4

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION (Cont.)		
		Write the expanded numeral of a base ten numeral (decimal), 0-1,000,000.
	Understand nondecimal numeration.	
		Write the Roman numeral for an Arabic numeral, 0-500.
		Write the Arabic numeral for a Roman numeral up to D.
	Understand the concept of odd and even numbers.	
		Find sums and differences for problems using odd and even numbers.
WHOLE NUMBERS - OPERATIONS		
	Know how to add and subtract whole numbers using standard algorithms.	
		Check subtraction problems by writing related forms of the problems in addition.
		Use mental arithmetic to compute sums and differences less than 100.
	Understand the commutative and associative properties of addition (as defined in previous grades).	

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
		Find the sum of an addition problem with three to six addends by renaming and rearranging the addends using the commutative and associative properties.
	Understand multiplication and division of whole numbers.	
		Use sets or a number line to find products or quotients.
		Show how to find products and quotients through repeated addition or subtraction.
		Write two multiplication and two division equations to describe a physical situation.
		Name, using immediate recall, products or quotients through 81; use a number line as proof.
		Name the products for problems up to three digits.

ELEMENTARY MATH
GRADE 4

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
	Understand the commutative property of multiplication using one-digit numerals (as defined in previous grades).	
		Solve equations using the commutative property of multiplication and one-digit numerals.
	Understand the associative property of multiplication using one-digit numerals (as defined in previous grades).	
		Solve equations using the associative property of multiplication and one-digit numerals.
	Understand the identity element for multiplication using one-digit numerals (as defined in previous grades).	
		Solve equations using the identity element for multiplication and one-digit numerals.
	Understand the multiplicative property of 0.	
		Solve equations using the property of 0.
	Understand the distributive property of multiplication over addition (as defined in grade 3).	

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
		Demonstrate the distributive property using sets.
FRACTIONS AND DECIMALS		
	Understand fractional numbers, equivalent fractions, improper and mixed fractions.	
		Identify, name, read and write the fraction and/or the mixed numeral for the number associated with a given fraction.
		Write a set of fractions which are equivalent.
		Rename a given fraction in simplest form.
		Name two fractions with like denominators and write the symbols $>, <, =, \neq$ to express the relationship between them.
	Understand decimal fractions to hundredths.	
		Identify, name, read and write a decimal fraction for a given model.
		Identify, name, read and write given decimal fractions with common fractions having denominators of 10 or 100.
	Understand place value of fractions.	

ELEMENTARY MATH
GRADE 4

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
FRACTIONS AND DECIMALS (Cont.)		Name the place value for each digit in a decimal fraction to the hundredths place.
	Know how to order fractions.	Order decimal fractions up to tenths place.
FRACTION OPERATIONS		
	Know how to add and subtract fractions or decimals.	Name the sums or differences of two fractions or decimal fractions.
		Add and subtract decimal fractions to the hundredths place, including expressions of money.
MEASUREMENT AND ESTIMATION		
	Understand the following units of measurement: length, area, capacity, time, money, weight, temperature.	Select a suitable unit and/or measuring device and measure physical property.
		Tell and write time to the nearest minute, showing a.m. and p.m.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MEASUREMENT AND ESTIMATION (Cont.)		
		Count money and make change up to $25.00.
		Use various measuring devices to measure length in whole and fractional parts of units.
		Find the perimeter of a polygon by adding the measures of the sides.
		Measure the capacity of a container without using a formula.
		Give the weight of an object to the nearest pound (kg.), using simple scales.
		Give the temperature in Fahrenheit and Celsius to the nearest degree using thermometers. (See also Science Curriculum Guide.)
		Use appropriate terms, abbreviations and symbols for the units of measurement in both English and metric systems.

ELEMENTARY MATH
GRADE 4

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MEASUREMENT AND ESTIMATION (Cont.)		
	Know how to estimate measures.	
		Estimate length, weight and capacity using standard units of measure.
	Understand the relationship between units of measure.	
		Convert units of measure into other units of the same system.
GEOMETRY		
	Know how to identify simple plane geometric and space figures.	
		Distinguish among isosceles, equilateral and right triangles.
		Identify the diagonal of a square or rectangle.
		Define line and plane.
		Identify simple closed curves and interior and exterior regions of plane figures.
		Fill the interior space of a simple solid figure with unit cubes to determine volume.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
GEOMETRY (Cont.)	Know how to construct basic geometric figures.	
		Draw and label lines, line segments, rays, angles, polygons and quadrilaterals using a straightedge and compass.
		Construct a right angle and right triangle using a straightedge and folded paper.
		Construct a circle, given the radius.
		Draw intersecting and perpendicular lines.
	Know how to graph on a number line or coordinate plane.	
		Explain and demonstrate that points in a plane (the first quadrant) can be represented by ordered pairs of numbers (coordinates).
		Plot ordered pairs on a coordinate plane (first quadrant).
		Graph a set of numbers on a number line.

ELEMENTARY MATH
GRADE 4

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
GEOMETRY (Cont.)		
	Know how to measure geometric figures.	
		Find the perimeter of a polygon by adding the measures of the sides.
MATH SENTENCES		
	Know how to write and solve math sentences.	
		Translate an English sentence into a mathematical sentence and solve.
PROBABILITY AND STATISTICS		
	Know how to gather data, make simple graphs and average.	
		Use information from charts and tables to solve problems.
		Construct simple bar, line, picture and circle graphs.
	Understand simple permutations.	
		Solve problems that involve a systematic identification of ordered arrangements using models, pictures, lists or diagrams to organize data.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
PROBLEM SOLVING	Understand patterns and sequences in problem solving.	
		Continue a pattern of numbers involving multiplication or division and with five or fewer factors.
		Solve problems involving the four basic mathematical operations, using data from charts, tables, graphs and maps.
	Know how to identify relevant and nonrelevant information in problem solving.	
		Create word problems from a social studies or science text that can be solved with a mathematical operation.
		Tell when information is insufficient to solve a problem.
	Understand the role of estimation in problem solving.	
		Explain how to use estimation as a tool for solving a problem.
	Know how to restate a problem.	
		Restate a problem in his or her own words and select the data and operations necessary for solving the problem. (See also Language Arts Curriculum Guide.)

ELEMENTARY MATH
GRADE 4

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
PROBLEM SOLVING (Cont.)		
		Express a solution in a form compatible with a problem context.
CALCULATORS AND COMPUTERS		
	Know how to operate a hand calculator. (See also Computer Education Curriculum Guide.)	
		Demonstrate how to add, subtract, multiply and divide on a hand calculator.
	Know how to use software and hardware to solve problems.	
		Use a computer to perform calculations.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
SETS	Understand set concepts and basic principles of sets.	
		Identify the set that is the union and the set that is the intersection of two given sets.
		Define finite, infinite and empty sets.
		Construct a Venn diagram that illustrates the relationships between two or three given sets.
WHOLE NUMBERS - COUNTING AND NUMERATION	Understand concepts related to counting, reading, writing and recognizing numbers and their order.	
		Identify, name, read and write numerals for whole numbers 0-1,000,000.
		Use $<$, $>$, $=$, $\neq$ to express the relationship between numbers up to 1,000,000.
	Understand place value to ten digits.	

ELEMENTARY MATH
GRADE 5

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION (Cont.)		
		Identify and name place value for each digit in a base ten (decimal) numeral.
		Write the expanded numeral using multiples of 10 for numerals up to 1,000,000.
	Understand nondecimal numeration.	
		Write the Roman numeral for numbers up to 1,000.
		Write the Arabic number for a Roman numeral up to M.
	Know how to round and estimate whole numbers.	
		Round a whole number to any place, up to 1,000,000.
		Estimate the sum, difference, product, or quotient of whole numbers.

ELEMENTARY MATH
GRADE 5

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION (Cont.)	Understand factors and multiples.	List all factors of any whole number less than 100.
		Name the least common multiplier (LCM) of two whole numbers less than 20.
	Understand primes and composites.	Classify whole numbers greater than 1 and less than 100 as prime or composite.
WHOLE NUMBERS - OPERATIONS	Know how to add and subtract whole numbers using standard algorithms.	Name the sums and differences for problems with numerals up to 1,000,000.
		Use mental arithmetic to compute reasonable sums and differences less than 1000.

ELEMENTARY MATH
GRADE 5

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
	Know how to use the commutative and associative properties of addition and multiplication (as defined in previous grades).	
		Find the sum and product of a problem with three or more addends or factors in the easiest way by using the commutative and associative properties.
	Know how to multiply and divide whole numbers using standard algorithms.	
		Write the two related division equations of a multiplication equation.
		Name the products for problems using four-digit factors by three-digit factors.
		Name the quotients and remainders for problems with five-digit dividends and two-digit divisors with and without remainders.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS (Cont.)		
		Use the short algorithm (short division form) to find quotients and remainders for problems with four-digit dividends and one-digit divisors with and without remainders.
		Use the distributive property for multiplying two digits times one digit problems.
FRACTIONS AND DECIMALS		
	Understand fractional numerals, equivalent, improper and mixed fractions.	
		Identify, name, read and write fractions that are pictured or modeled.
		Name the numerators and denominators of a given list of fractions.
		Rename an improper fraction as a mixed number and vice versa.
		Write a set of fractions that are equivalent to a given fraction.
	Know how to order fractions.	
		Order up to five fractions from least to greatest or from greatest to least.

ELEMENTARY MATH
GRADE 5

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
FRACTIONS AND DECIMALS (Cont.)		
	Understand decimal fractions to thousandths.	
		Identify, name, read and write decimal fractions having denominators of 10, 100, or 1000.
		Name the place value for each digit in a list of decimal fractions up to the thousandth place.
		Round decimal fractions to the nearest whole number, tenth or hundredth.
FRACTION OPERATIONS		
	Know how to add and subtract fractions using standard algorithms.	
		Find the sum or difference of fractions using a model.
		Check subtraction of fraction problems through addition.
		Estimate the sum or difference of two fractions to the nearest whole number.
		Use the commutative and associative properties to add and subtract fractions.

111

112

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
FRACTION OPERATIONS (Cont.)		Solve equations using the identity element.
	Know how to multiply fractions using standard algorithms.	
		Multiply fractions and find the products using a multiplication model.
		Solve equations giving the products in lowest terms and written as whole numbers and fractions.
		Check division problems through multiplication.
		Use the commutative and associative properties to simplify computations.
MEASUREMENT AND ESTIMATION		
	Understand the process of measurement.	
		Determine local time for cities in the U.S.; explain the concept of time zones.
		Measure time in seconds, minutes, hours, days, weeks, months, years, decades and centuries.
		Compute math problems that involve money.

ELEMENTARY MATH
GRADE 5

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
MEASUREMENT AND ESTIMATION (Con't.)		
		Measure length in whole and fractional units using various measuring devices.
		Compute the perimeter of a polygon.
		Give the temperature to the nearest degree in Celsius and Fahrenheit.
		Give the freezing and boiling points of water in English and metric units.
		Use the appropriate terms, abbreviations and symbols for units of measurement.
		Estimate length, weight, capacity, time, temperature and money.
	Understand the relationships between units of measure.	
		Rename a measure in other units.
		Compute a measurement problem, and rename the result if necessary.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
GEOMETRY	Know how to identify and measure simple plane figures.	
		Define plane geometric figures.
		Read and write standard notation for plane figures.
		Define and measure an angle using a protractor.
	Know how to identify simple space figures.	
		Distinguish among models of common polyhedra.
	Understand symmetry.	
		Define symmetry as it relates to point and line.
	Understand congruency.	
		Identify pairs of line segments, angles, triangles or other polygons as congruent or not congruent.
	Understand intersecting and perpendicular lines.	
		Sketch, describe and give examples of intersecting and perpendicular lines.

ELEMENTARY MATH
GRADE 5

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
GEOMETRY (Cont.)	Know how to construct and bisect plane figures.	
		Construct and label models of lines, line segments, rays, angles, and polygons using a straightedge.
		Bisect a given line segment and angle using a straightedge and compass.
		Construct a circle with a given center and radius or diameter, using a compass.
	Know how to measure geometric figures.	
		Measure the circumference and diameter of cutout circles; explain the relationship between circumference and diameter.
MATH SENTENCES	Understand math sentences of greater complexity.	
		Use $>$, $<$, $=$, $\neq$ to make true number sentences.
		Classify types of sentences as true or false.
		Translate an English sentence into a mathematical sentence and solve.

ELEMENTARY MATH
GRADE 5

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
PROBABILITY AND STATISTICS	Understand data gathering and organization.	
		Compare bar, line and picture graphs which represent the same information; explain the advantages and disadvantages of each form.
		Analyze collected data according to range and mean.
		Make predictions based on simple data and verify the predictions with further experiments or additional research.
	Understand probability.	
		Conduct probability experiments, using an increasing number of trials to obtain more reliable results.
		Identify events that are impossible and relate them to a probability of zero.
		Identify events that are certain and relate them to a probability of one.
		Conduct an experiment using random and unbiased samples.

ELEMENTARY MATH
GRADE 5

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner w[illegible]	The Learner will:
GRAPHS AND SCALE . DRAWING	Know how to construct picture, bar and line graphs.	
		Construct picture, bar and line graphs given suitable data.
		Use the number line to represent positive and negative integers.
		Construct a double bar graph.
		Record statistical data on tables or graphs, indicating change.
PROBLEM SOLVING	Know how to solve problems.	
		Use data from charts, tables, graphs, tree diagrams and maps to solve problems.
		Tell when information is insufficient to solve a problem and irrelevant to the problem.
		Use rounding to estimate results for word problems.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
PROBLEM SOLVING (Cont.)		Choose items from a catalog and calculate their cost including postage, handling and other expenses.
		Calculate the balance in a checking account using bank statements, bank deposit slips and bank checks.
CALCULATORS AND COMPUTERS	Know how to write computer programs to solve problems. (See also Computer Education Curriculum Guide.)	
		Program and use the computer to create graphics.
		Program and use the computer to perform arithmetic operations.
	Know how to use calculating devices.	
		Use a calculator to add, subtract, multiply and divide whole numbers and decimals.

ELEMENTARY MATH
GRADE 6

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION		
	Understand concepts related to counting, reading, writing and recognizing numbers and their order.	
		Write the number words and Arabic numerals for numbers up to 15 digits.
		Write a subset of whole numbers in order from least to greatest.
	Understand place value.	
		Name the period value for each group of three digits and place value for each digit of a base ten numeral.
		Write a six-digit numeral in expanded notation.
	Understand nondecimal numeration.	
		Describe the difference between Roman and Arabic numerals, including place value.
		Describe the cardinal number of a set of elements (0-100) in a base other than 10.
		Write a decimal numeral in a different base.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION (Cont.)		
	Know how to round and estimate whole numbers.	
		Round a seven-digit numeral.
		Estimate sums, differences, products and quotients of whole numbers.
	Understand factors and multiples.	
		List all factors of any whole number less than 100.
		Name the greatest common factor of the numbers less than 25.
		Name the least common multiple of the numbers less than 20.
	Understand prime numbers and composites.	
		Classify a set of whole numbers as prime, composite or units.
		Define composite number.
		List all prime numbers less than 100.

ELEMENTARY MATH
GRADE 6

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION (Cont.)		
	Understand exponential notation.	
		Identify and rename a product in exponential form.
		Find the value of a number expressed in exponential form.
	Understand scientific notation.	
		Rename a given numeral using scientific notation.
WHOLE NUMBERS - OPERATIONS		
	Know how to add, subtract, multiply and divide whole numbers using standard algorithms.	
		Find the sum of an addition or multiplication problem with three or more addends or products using the associative and commutative properties.
		Check division problems without remainder by multiplication; check division problems with remainder by multiplication and addition.
		Use the short algorithm to name the quotient and remainder for any reasonable division problem with a single-digit divisor.

ELEMENTARY MATH
GRADE 6

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
FRACTIONS AND DECIMALS		
	Understand fractional numerals, equivalent, improper and mixed fractions.	
		Explain the function of numerators and denominators.
		Name the missing numerator or denominator for a mathematical sentence.
	Know how to order fractions.	
		Order more than five fractions from least to greatest.
	Understand decimal fractions.	
		Identify, name, read and write decimal fractions having denominators of 10, 100, 1000 or 10,000.
		Write a fraction in decimal form or a decimal fraction as a fraction in simplest form.
		Distinguish between repeating and terminating decimal fractions.
		Round decimals to any place.
		Estimate the sum, difference, product or quotient of the decimals.

ELEMENTARY MATH
GRADE 6

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
RATIO, PERCENT AND PROPORTION	Understand ratio, percent and proportion.	Write a ratio using a rational number form and express the ratic in words. Name the equivalent form of a ratio with a denominator of 100. Rename percents as fractions or decimals.
FRACTION OPERATIONS	Understand multiplication inverses.	Name the multiplication inverses of a set of rational numbers (reciprocals) and demonstrate that the product of any rational number and its reciprocal is one.
	Know how to multiply and divide fractions.	Multiply two decimals to the hundredths place. Divide a decimal by a whole number or by a decimal to the hundredths place.

ELEMENTARY MATH
GRADE 6

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner will:	The Learner will:
INTEGERS		
	Understand concepts related to integers.	
		Represent a physical situation such as a gain or loss in temperature with a positive or negative integer.
		Graph positive and negative numbers on a number line.
		Demonstrate how to find the sum of two integers.
GEOMETRY		
	Know how to identify simple plane and space figures.	
		Identify right, acute and obtuse angles.
		Classify a set of quadrilaterals as parallelograms, rectangles, rhombuses, squares or trapezoids.
	Understand similarity and congruency.	
		Use the symbol (≅) to express the relationship between congruent figures.
		Explain the difference between equal and congruent figures.
	Know how to construct and bisect plane figures.	

ELEMENTARY MATH
GRADE 6

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
GEOMETRY (Cont.)		
		Sketch examples of parallel, intersecting and perpendicular lines, using a straightedge.
		Construct a plane figure congruent to a given line segment, angle or triangle, using a straightedge and compass.
		Construct a circle, semi- or quarter circle with a given center and radius or diameter, using a compass.
MATH SENTENCES	Know how to write and solve math sentences.	
		Use $<$, $>$, $=$, and $\neq$ to make true number sentences involving whole numbers, fractions, decimals, ratios and percents.
		Determine the solution set for open sentences with the replacement set of whole numbers.
PROBABILITY AND STATISTICS		
	Understand data gathering, organization and graphing.	
		Collect, organize, analyze and illustrate data compiled from opinion polls, experiments, reference books, etc.

ELEMENTARY MATH
GRADE 6

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner will:	The Learner will:
PROBABILITY AND STATISTICS (Cont.)		
		Develop an extended recordkeeping project that includes collecting, organizing and graphing data.
		Report on the use of probability and statistics in careers.
		Discuss the importance of unbiased sampling while studying real-life issues.
		Demonstrate the multiplication principle of probability through experiments with tree diagrams or rosters.
PROBLEM SOLVING		
	Know how to solve problems.	
		Use estimation to determine if solutions to word problems are reasonable.
		Interpret variations in a model in terms of the original problem situation.

ELEMENTARY MATH
GRADE 6

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner will:	The Learner will:
CALCULATORS AND COMPUTERS		
	Know how to use a calculator. (See Computer Education Curriculum Guide.)	
		Use a calculator to find sums, differences, products or quotients of integers or decimals.
		Find the percent of a number using a calculator.
		Find the square root of a number using a calculator.

ELEMENTARY MATH
GRADE 7

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner will:	The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION		
	Understand concepts related to counting, reading, writing and recognizing whole numbers.	
		Identify, name, read and write different names for the same number, using different numeration systems and formats.
	Understand expanded notation.	
		Write an expanded numeral using exponential notation.
	Understand divisibility rules.	
		Use divisibility rules for 2, 3, 5, 9 and 10 as an aid in factoring.
	Understand factors and multiples.	
		Find all the factors of a given whole number less than 1000.
		List multiples of a given whole number less than 1000.
		Determine the greatest common factor of a set of three numbers having less than four digits.

145

146

ELEMENTARY MATH
GRADE 7

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - COUNTING AND NUMERATION (Cont.)		
		Determine the least common multiple of a set of numbers having less than four digits.
	Understand prime numbers and composites.	
		Determine the complete prime factorization for any whole number having less than four digits.
	Understand scientific notation.	
		Write any number, having less than seven digits, in scientific notation.
	Understand squares and square roots.	
		Find the square of any whole number less than 100.
		Find the square root of a perfect square whole number less than 200.
WHOLE NUMBERS - OPERATIONS		
	Know how to add, subtract, multiply and divide whole numbers.	
		Perform any basic operation involving whole numbers.

147

148

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
FRACTIONS AND DECIMALS		
	Understand decimal notation.	
		Read a numeral such as 2,479.6305 and write it in words.
	Understand terminating decimals and fraction equivalents.	
		Determine the equivalents for common fractions given a set of decimal fractions.
		Write a set of fractions and decimal fractions that are equivalent to 7/8.
	Know how to add, subtract, multiply and divide fractions and decimals.	
		Find the sum, difference, product and quotient of fractions, mixed numerals and decimal fractions.
		Use the properties of addition and multiplication of decimal fractions.
RATIO, PERCENT, AND PROPORTION		
	Understand ratio, percent and proportion.	
		Demonstrate that a proportion is a statement of two equivalent ratios.

ELEMENTARY MATH
GRADE 7

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
RATIO, PERCENT, AND PROPORTION (Cont.)		Compute the percent of a number using equivalent fractions or decimals.
INTEGERS	Understand the concept of integers.	
		Add, subtract, multiply and divide integers.
MEASUREMENT AND ESTIMATION	Understand the process of measuring.	
		Use various measuring devices to measure length in whole and fractional parts of customary or metric units.
		Measure time and temperature.
		Solve problems involving money.
		Find the perimeter of a given polygon and the circumference of a given circle.
		Measure the angles of polygons using a protractor.
		Estimate length, weight, time, temperature and money using appropriate units and terms.

ELEMENTARY MATH
GRADE 7

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
GEOMETRY	Understand complementary and supplementary angles.	
		Measure an angle and find its complement or supplement.
	Know how to measure angles in geometric figures.	
		Find the sum of the angles in a polygon.
MATH SENTENCES	Know how to write and solve math sentences.	
		Solve simple linear equations using non-negative, rational numbers in the replacement set.
		Apply the operational symbols, +, -, x and ÷ to form true sentences using non-negative rational numbers and integers.
		Solve simple inequalities.
		Use brackets and parentheses to show the order of operation in mathematical expressions involving addition, subtraction, multiplication and division.

153

154

ELEMENTARY MATH
GRADE 7

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
PROBABILITY AND STATISTICS		
	Know how to determine mean.	
		Find the arithmetic mean (average) for a given set of numerical data.
PROBLEM SOLVING		
	Know how to solve problems.	
		Determine the rule for completing a number pattern.
		Construct flow charts to show steps in operations and solutions of word problems.
		Formulate math statements to describe problem situations.
		Select processes and formulas to solve word problems.
CALCULATORS AND COMPUTERS		
	Know how to use computer hardware and software to solve problems. (See Computer Education Curriculum Guide.)	
		Use spread sheet software to perform repetitive calculations.

ELEMENTARY MATH
GRADE 8

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
WHOLE NUMBERS - OPERATIONS	Understand the basic operations involving whole numbers.	Solve problems involving whole numbers to demonstrate proficiency in the basic operations.
FRACTIONS AND DECIMALS	Understand equivalent fractions and their order.	Write a set of fractions which are equivalent to 15/16 in common and decimal forms. Order a set of ten common fractions and a set of ten decimal fractions from least to greatest. Determine the equivalent common fractions of a set of terminating decimals. Determine the equivalent decimal fractions of a set of common fractions.

ELEMENTARY MATH
GRADE 8

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
RATIO, PERCENT AND PROPORTION	Understand ratio and proportion.	Write the ratio that describes the comparison of any two quantities in both forms and express it in words. Determine the value of the missing component of a proportion.
	Know how to solve percent problems.	Find the percent of a number using equivalent fractions or decimals. Find the percentage given the base and rate. Rename percents as equivalent forms. Solve problems involving discount, simple interest, commission and sales tax.

ELEMENTARY MATH
GRADE 8

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
INTEGERS	Understand concepts related to integers.	
		Graph integer numbers on a number line.
		Order a set of integers from greatest to least.
		Add, subtract, multiply and divide integers.
		Write the absolute value of each integer in a set.
MEASUREMENT AND ESTIMATION		
	Understand the process of measuring.	
		Find the approximate area of an irregular figure drawn on graph paper.
		Compute the surface area of rectangular prisms, cubes, spheres, pyramids and cylinders using appropriate formulas.
		Find the volume of cylinders, cubes and rectangular solids.
		Use a conversion formula to change temperature from Celsius to Fahrenheit.
		Solve problems relating to speed.

ELEMENTARY MATH
GRADE 8

TOPIC/CONCEPT	LEARNING OUTCOME	SAMPLE LEARNING OBJECTIVE
	The Learner will:	The Learner will:
GEOMETRY	Know how to apply basic mathematical operations to geometry.	
		Solve problems related to computation and measurement of geometric figures to demonstrate proficiency.
MATH SENTENCES	Know how to write and solve math sentences.	
		Write and solve linear equations to demonstrate proficiency in applying operational symbols, constructing mathematical sentences, determining solution sets, using proportion, translating English sentences into mathematical sentences, using parentheses and brackets, determining averages and simple probability.
PROBLEM SOLVING	Know how to solve problems.	
		Use diagrams as an aid to problem solving.
		Interpret and find solutions for multiple problems.

TOPIC/CONCEPT	LEARNING OUTCOME The Learner will:	SAMPLE LEARNING OBJECTIVE The Learner will:
CALCULATORS AND COMPUTERS	Know how to use a hand calculator to solve problems. (See also Computer Education Curriculum Guide.)	
		Use a hand calculator to solve simple equations.
	Know how to write simple computer programs to solve problems.	
		Program the computer to draw graphics.
		Program the computer to perform math operations.

APPENDIX A

At the elementary level, the following framework is employed, indicating grade level placement for topics/concepts:

GRADES	1	2	3	4	5	6	7	8
Sets	X	X	X	X	X			
Whole Numbers - Counting and Numeration	X	X	X	X	X	X	X	
Whole Numbers - Operations	X	X	X	X	X	X	X	X
Fractions and Decimals	X	X	X	X	X	X	X	X
Fraction Operations				X	X	X		
Measurement and Estimation	X	X	X	X	X		X	X
Geometry	X	X	X	X	X	X	X	X
Math Sentences		X	X	X	X	X	X	X
Probability and Statistics	X	X	X	X	X	X	X	
Graphs and Scale Drawings					X			
Problem Solving	X	X	X	X	X	X	X	X
Calculators and Computers	X	X	X	X	X	X	X	X
Integers						X	X	X
Ratio, Percent and Proportion						X	X	X

RESPONDENTS	PROBLEMS, ISSUES, CONCERNS	DISPOSITION
Lyn Maslow Bering Strait	Include more computer use at the first grade level.	Cross-referencing to computer guide has been included throughout elementary and secondary levels.
	Do not require students to master skills the same year they are taught.	The guides have been designed to represent sequential development of math skills.
	Teach concrete skills before abstract skills.	The guides have been revised accordingly.
	Specific suggestions were made directly on the guide.	These suggestions have been incorporated into the material to the greatest extent possible.
Jerry Sjolander Alaska Pacific University	Incorporate more concrete experiences for primary grades.	Done.
	There is too little emphasis on place value in grades two and three.	Additional objectives have been developed in this area and included in these grades.
	The integration of common fractions and decimal concepts in grade four is essential.	Agreed, and the material has been revised.
	Terminology such as associative and commutative is difficult.	The guides are intended for curriculum coordinators or directors; however, brief definitions of these terms have been included.

ALASKA CURRICULUM GUIDE: Elementary Math

RESPONDENTS	PROBLEMS, ISSUES, CONCERNS	DISPOSITION
Carol H. Jerue Iditarod Area S.D.	Specific changes noted on draft; also submitted list of objectives to add.	These changes have been incorporated into the material.
	Adjustments needed between concept/topic and learning outcomes; also between outcomes and objectives.	These adjustments have been made.
	Objectives that appear as examples or problems need to be rewritten.	Done.
	The concept of computers needs to be added throughout.	Cross-referencing to the Elementary Computer Guide has been added.
Doris Ayers Jim Seitz Cheryl Girardon Alaska Council of Teachers of Mathematics (ACTM)	Submitted guides with specific suggestions noted directly on the guides.	These suggestions have been incorporated into the material to the greatest extent possible.
Phyllis Marchese CCS	Structure of guides should be concepts, objectives, outcomes (measurable).	The following framework was agreed upon: Topic/Concept; Outcome; Objective (written in behavioral terms.
	The guides are inconsistent across all levels.	The guides have been revised to ensure consistency.

RESPONDENTS	PROBLEMS, ISSUES, CONCERNS	DISPOSITION
Phyllis Marchese CCS (cont.)	There is a lack of basic instruction in remedial skills and hands-on application and activities.	Additional objectives in this area have been added. It was decided by the Department in consultation with the Curriculum Cabinet that no remedial courses or programs be included in these guides as the learning outcomes sought are not different from regular courses or programs.
	Word problems are treated as an isolated concept.	The guides have been revised to integrate more word problems across all topic/concept areas.
	Problem solving should be integrated across the board.	Done.
Margaret McKinnon CCS	Need examples for the learning objectives to clarify such terminology as "commutative".	As the guides are intended for use by curriculum directors, it was determined that a listing of examples and activities would not be a function of the guides, but would be left to the discretion of individual teachers.
	"Understand set theory" is too intimidating; the processes relate to counting, adding and subtracting.	Agreed and these changes have been made.
	For measurement, specify types and sizes of units to be measured at each grade level.	Done.

RESPONDENTS	PROBLEMS, ISSUES, CONCERNS	DISPOSITION
Margaret McKinnon CCS (cont.)	For geometry, specify types of figures to be studied at each grade level.	Done.
	Add more application objectives for consumer topics and computer literacy.	Done.
	Specific comments were written directly on the guides.	These were incorporated into the material to the greatest extent possible.

ALASKA
MODEL
CURRICULUM
GUIDE
PROJECT

Subject: MATH
Course:
Level: ELEMENTARY
Grade(s): 1-8
Date: 8-20-85

PERCENTAGE OF EDUCATIONAL OUTCOMES

Objective	N	%	Histogram of Percentages (10 20 30 40 50 60 70 80 90 100)
COGNITIVE			
1.10 Knowledge of specifics	45	22	**********
1.20 Knowledge of ways and means of dealing with specifics	5	2	*
1.30 Knowledge of universals and abstractions	0	0	
2.00 Comprehension	110	54	**********
3.00 Application	32	16	********
4.00 Analysis	8	4	**
5.00 Synthesis	2	1	*
6.00 Evaluation	0	0	
SUBTOTAL	202	100	
AFFECTIVE	0	0	
PSYCHOMOTOR	0	0	
Not Classifiable	0	0	
TOTAL	202	100	