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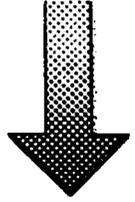
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ABSTRACT

This basic guide to a complete secondary mathematics curriculum is designed to ensure that each student will be presented uniform mathematical concepts and principles, geared to his individual needs, abilities, and interests. The guide is not planned for use with a particular textbook; instead, it is to serve as a core around which each teacher can develop his program of instruction using a wide range of supplementary materials. Two program sequences are presented, one for college-preparatory students and one for vocational students. Mathematical procedures and concepts have been developed and arranged in a learning sequence. As a student completes one phase of the program, he can move immediately to the sequence that follows. The college-preparatory sequence is a continuum with interwoven new mathematical concepts presented by rigorous methods of deductive reasoning. The vocational-preparatory continuum is developed around problems that relate to occupations and careers and provides a review of the basic fundamentals of mathematics. Behavioral objectives are stated and resource books are listed for topics. (JP)

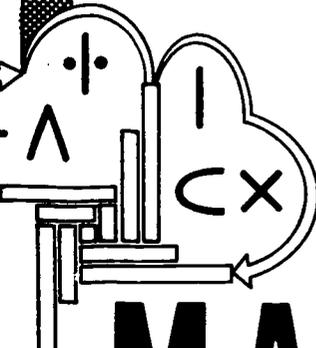
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CURRICULUM GUIDE

FOR



MATHEMATICS

UNION PARISH :::: HIGH SCHOOLS

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CURRICULUM GUIDE FOR MATHEMATICS

IN

UNION PARISH HIGH SCHOOLS

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Farmerville, Louisiana

Union Parish Schools

1972

Curriculum Guide for Mathematics

Developed for

ESEA Title III Pilot Project

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FOREWORD

The increasing contribution of mathematics to the culture of the modern world, as well as its importance as a vital part of scientific and humanistic education, has made it essential that the mathematics in our schools be both well selected and well taught. School systems commonly lack a comprehensive and reasonably consistent set of mathematical objectives. To this end, the Union Parish School System has attempted to develop a continuous program in secondary mathematics.

The program is designed as a basic guide to ensure that each student will be presented uniform mathematical concepts and principles, geared to his individual needs, abilities, and interests. Since no single source of information is adequate in teaching, the guide is not planned for the use of any particular textbook. Instead it is to serve as a core around which each teacher can develop his program of instruction, using a wide range of supplementary materials.

It is hoped that the program will lead the student to a better understanding of mathematics, thus enabling him to make a greater contribution to society.

OBJECTIVES

1. To introduce individualized instruction in mathematics into the Union Parish high schools through the use of this curriculum guide.
2. To improve teachers' effectiveness in teaching mathematics.
3. To improve students' attitude toward mathematics.
4. To give students the opportunity to advance individually without being time locked into a traditional program.
5. To measure student's achievement on an individualized basis.
6. To improve pupil mastery of content material in mathematics.
7. To develop skill in logical thinking.
8. To help the student relate mathematical problems and skills to real life situations.
9. To develop a systematic program of mathematical instruction in Union Parish to help insure an improvement in academic quality.

IMPLEMENTATION OF THE PROGRAM

Individualized Instruction

This is an approach in which the student receives instruction as an individual. Whether he is a part of a large group, a small group, or working alone, he is under the supervision of a teacher. Working at his ability level enables each student to achieve a degree of success.

Placement

A student's initial placement in the program is determined by teacher recommendations and the student's achievement, ability, and vocational interests.

Continuous Learning

As a student completes one phase of the program, he will move immediately to the sequence that follows.

Behavioral Objectives

These are statements that deal with specific measurable goals. They are stated in precise language and define the desired behavior which can be observed when the student has completed the skill involved.

Continuum of Skills

This is a detailed curriculum guide, written in sequential form, for a particular subject area.

Structure of the Program

Mathematical procedures and concepts have been developed and arranged

in a learning sequence, each designated by a Roman numeral. It is suggested that each student complete at least 70% of the skills in each sequence before proceeding to the next.

Level A and Level B

The content material is divided into two parts, Level A and Level B, each representing approximately one half of the objectives to be attained in a given subject area.

Checklist

Because each student progresses at his own rate, it is important that an accurate record be kept. The teacher is to keep up to date the checklist which accompanies each learning sequence by checking each objective as it is attained. These checklists are to be kept by the teacher until the student completes the course, and the final checklist is to be placed in the student's permanent record folder.

Evaluation

Evaluation of the student is made by the teacher on the basis of observable behavior, performance tests, attitude, and attendance.

Enrichment

If a student completes all the learning sequences for a particular subject, he may choose from the topics listed for enrichment. These choices will vary according to his interests and abilities.

College-Preparatory

The continuum contains five courses designated as college-preparatory.

These are recommended primarily for students who plan to attend college. However, other students with special interests or abilities in mathematics may elect these courses

Vocational-Preparatory

The continuum contains three courses designated as vocational-preparatory. These are planned primarily for the non-college-bound student. However, these courses are designed so as to be beneficial to any student in his personal or business life.

Resources for Teachers

It is hoped that the guide will lead the teacher to use the many textbooks, programmed materials, and such visual aids as filmstrips, transparencies, tapes, charts, and models that are available. A list of resource books, used in developing this curriculum guide, is included and will be useful in implementing the program.

RESOURCE BOOKS

COLLEGE PREPARATORY CURRICULUM

<u>Modern Algebra, Book I</u>	Houghton Mifflin
<u>Modern Elementary Algebra</u>	Holt
<u>Modern Algebra and Trigonometry, Book II</u>	Houghton Mifflin
<u>Algebra, Book II</u>	Ginn
<u>Modern Geometry</u>	Houghton Mifflin
<u>A Course in Geometry, Plane and Solid</u>	Ginn
<u>A Modern Course in Trigonometry</u>	Holt
<u>Modern Trigonometry</u>	Houghton Mifflin
<u>Modern Trigonometry</u>	Ginn
<u>Principles of Mathematics</u>	McGraw-Hill

VOCATIONAL PREPARATORY CURRICULUM

<u>Applied Business Arithmetic</u>	Southwestern
<u>Mathematics in Daily Use</u>	Heath
<u>Business Mathematics</u>	McGraw-Hill
<u>Economic Mathematics</u>	Allyn and Bacon
<u>Essential Business Mathematics</u>	McGraw-Hill
<u>General Mathematics, I</u>	Laidlaw
<u>General Mathematics</u>	Holt
<u>Modern Basic Mathematics, Book I</u>	Singer
<u>Refresher Arithmetic</u>	Allyn and Bacon
<u>General Mathematics, II</u>	Laidlaw
<u>Second Course in Fundamentals of Mathematics</u>	Allyn and Bacon

INTRODUCTION TO
COLLEGE-PREPARATORY MATHEMATICS

This section of the continuum has been written primarily for college-bound students who need a comprehensive understanding of the concepts and principles of mathematics.

The ever-increasing complexity of our civilization, especially in the realm of science and technology, makes it imperative that the content of the mathematics curriculum be kept updated and the pace of the students' training be increased. For this reason the continuum has interwoven the new mathematical concepts with the rigorous methods of deductive reasoning.

It is of vital importance that the precollege student master the material in preparation for advanced work in his field. However, the mathematics presented in this guide is valuable for all well-educated citizens in our society.

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

LEVEL A AND LEVEL B

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level A

I. Variables and Open Sentences

A. Defines the terms needed in this unit such as

- | | |
|-------------------------|-----------------------------|
| 1. Domain | 7. Left member of equation |
| 2. Constant | 8. Right member of equation |
| 3. Algebraic expression | 9. Root |
| 4. Term | 10. Exponent |
| 5. Coefficient | 11. Base |
| 6. Algebraic sentence | 12. Power |

B. Recognizes and uses necessary symbols and abbreviations

C. Simplifies algebraic expressions using rules of order

D. Evaluates algebraic expressions

1. Without exponents
2. With exponents

E. Writes expressions using exponents and symbols of inclusion

F. Solves open sentences by

1. Substitution
2. Inspection

G. Describes solution sets by

1. Graphing
2. Tabulation

H. Converts verbal expressions to algebraic expressions

I. Solves verbal sentences using the following steps:

1. Reads problem and chooses variable

2. Forms open sentence from the given facts in the problem
 3. Finds the solution set
 4. Checks the answer with the words of the problem
- J. Devises alternative methods for solving verbal problems

CHECKLIST
ALGEBRA I CONTINUUM
Level A

PUPIL

TEACHER

I. Variables and Open Sentences

- A. Defines terms used in this unit
- B. Recognizes and uses symbols and abbreviations
- C. Simplifies algebraic expressions using rules of order
- D. Evaluates algebraic expressions
- E. Writes expressions using exponents and symbols of inclusion
- F. Solves open sentences
- G. Describes solution sets
- H. Converts verbal expressions to algebraic expressions
- I. Solves verbal sentences

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level A

II. Axioms, Equations, and Problem Solving

A. Identifies

- | | |
|---------------|-------------------------|
| 1. Axiom | 5. Similar (like) terms |
| 2. Assumption | 6. Unlike terms |
| 3. Postulate | 7. Equivalent equations |
| 4. Proof | 8. Identities |

B. Names and uses axioms of equality

1. Reflexive
2. Symmetric
3. Transitive

C. Recognizes and applies properties of the number system

1. Closure
2. Commutative
3. Associative
4. Distributive
5. Multiplicative identity
6. Additive identity
7. Multiplicative inverse
8. Additive inverse

D. Knows and applies

1. Substitution property
2. Multiplicative property of zero

- E. Uses properties of the number system to
 - 1. Evaluate numerical expressions
 - 2. Explain and construct proofs
 - 3. Simplify algebraic expressions
- F. Transforms equations using
 - 1. Addition property of equality
 - 2. Subtraction property of equality
 - 3. Division property of equality
 - 4. Multiplicative property of equality
- G. Forms equivalent equations by combining terms and using transformation properties and solves them
- H. Translates verbal problems to algebraic statements and solves

CHECKLIST
ALGEBRA I CONTINUUM
Level A

PUPIL

TEACHER

II. Axioms, Equations, and Problem Solving

- A. Identifies needed terms
- B. Names and uses axioms of equality
- C. Recognizes and applies properties of the number system
- D. Knows and applies
 - 1. Substitution property
 - 2. Multiplicative property of zero
- E. Uses properties of the number system to
 - 1. Evaluate numerical expressions
 - 2. Explain and construct proofs
 - 3. Simplify algebraic expressions
- F. Transforms equations using equality properties of
 - 1. Addition
 - 2. Subtraction
 - 3. Division
 - 4. Multiplication
- G. Solves equations using transformation properties
- H. Solves verbal problems

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level A

III. Operating with Directed Numbers

A. Defines

1. Signs of direction
2. Directed numbers
3. Magnitude
4. Absolute value

B. Expresses phrases as directed numbers

C. Compares directed numbers using

1. Symbols of equality and inequality
2. Points on the number line

D. Has a working knowledge of

1. Addition on the number line
2. Opposite of a directed number
3. Opposite of the sum of two numbers
4. Absolute value (magnitude)

E. Adds directed numbers using rules for addition

F. Subtracts directed numbers applying definition and rules for subtraction

G. Demonstrates an understanding of the multiplicative property of -1

H. Multiplies directed numbers using rules for multiplication

I. Has a working knowledge of

1. Reciprocal

2. Reciprocal of a product
 3. Definition of division
- J. Divides directed numbers using rules of division
 - K. Improves skills in operating with directed numbers by devising and using shortcuts
 - L. Combines terms and evaluates expressions using extended properties
 - M. Changes verbal sentences to algebraic sentences and solves

CHECKLIST
ALGEBRA I CONTINUUM

Level A

PUPIL

TEACHER

III. Operating with Directed Numbers

- A. Defines terms needed in this unit
- B. Expresses phrases as directed numbers
- C. Compares directed numbers
- D. Has a working knowledge of
 - 1. Addition on the number line
 - 2. Opposite of a directed number
 - 3. Opposite of the sum of two numbers
 - 4. Absolute value (magnitude)
- E. Adds directed numbers
- F. Subtracts directed numbers
- G. Multiplies directed numbers
- H. Uses concept of reciprocals
- I. Divides directed numbers
- J. Combines terms and evaluates expressions
- K. Solves verbal sentences

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level A

IV. Equations, Inequalities, and Problem Solving

A. Defines

1. Order, direction, or sense of an inequality
2. Equivalent inequality
3. Complementary angles
4. Supplementary angles
5. Integer
 - a. Even
 - b. Odd
 - c. Consecutive

B. Has a working knowledge of

1. Order property of numbers
2. Properties of inequalities
 - a. Transitive
 - b. Additive
 - c. Multiplicative
3. The fact that the sum of the angles of a triangle equals 180°

C. Solves equations

1. For a designated variable
2. Containing symbols of inclusion and negative multipliers

D. Solves inequalities and graphs solution sets using appropriate properties

E. Categorizes verbal problems into groups and solves

1. Number relations
2. Consecutive integers
3. Angle relations
4. Uniform motion
5. Mixture

CHECKLIST
ALGEBRA I CONTINUUM
Level A

PUPIL

TEACHER

IV. Equations, Inequalities, and Problem Solving

- ___ A. Defines terms associated with this unit
- ___ B. Knows and applies
 - ___ 1. Order property of numbers
 - ___ 2. Inequality properties
 - ___ 3. Triangle-sum property
- ___ C. Solves equations for designated variable
- ___ D. Solves inequalities
- ___ E. Graphs solution sets of inequalities
- ___ F. Solves verbal problems

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level A

V. Working with Polynomials

- A. Defines and recognizes the family of polynomials
 - 1. Monomial (term)
 - 2. Binomial
 - 3. Trinomial
- B. Indicates the degree of a polynomial
- C. Arranges terms of a polynomial in order of increasing or decreasing degree in a variable
- D. Adds polynomials
- E. Subtracts polynomials
- F. Solves and checks more advanced equations containing polynomials
- G. Recognizes and uses rules of exponents for
 - 1. Multiplication
 - 2. Power of a product
 - 3. Power of a power
- H. Simplifies expressions containing exponents
- I. Uses distributive property to multiply
 - 1. Polynomial by monomial
 - 2. Polynomial by polynomial
- J. Simplifies expressions and solves problems using polynomial-polynomial products
- K. Expands a polynomial expression
- L. Solves and checks verbal problems using products and powers of polynomials

- M. Defines concept of zero used as an exponent
- N. Uses property of quotients and division rules of exponents to divide
 - 1. Monomial by monomial
 - 2. Polynomial by monomial
 - 3. Polynomial by polynomial

CHECKLIST
ALGEBRA I CONTINUUM
Level A

PUPIL

TEACHER

V. Working with Polynomials

- A. Defines and recognizes the family of polynomials
- B. Indicates the degree of a polynomial
- C. Arranges terms of a polynomial in order
- D. Adds polynomials
- E. Subtracts polynomials
- F. Solves and checks equations containing polynomials
- G. Uses rules of exponents in multiplication
- H. Simplifies expressions containing exponents
- I. Uses distributive property to multiply polynomials
- J. Simplifies expressions and solves problems using polynomial-polynomial products
- K. Expands a polynomial expression
- L. Solves verbal problems using products and powers of polynomials
- M. Defines the concept of zero used as an exponent
- N. Divides polynomials

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level B

VI. Special Products and Factoring

A. Defines

1. Factor
2. Prime number
3. Greatest common factor
4. Linear term
5. Quadratic term
6. Standard form
7. Multiple root

B. Factors monomials

1. Over the set of primes
2. Into positive integral factors
3. To find greatest common factor

C. Computes special products such as

1. Squaring a monomial
2. Multiplying the sum and difference of the same two numbers
3. Squaring a binomial
4. Multiplying any two binomials using the sight method (FOIL)

D. Identifies and factors polynomials

1. With a common monomial factor
2. With a common polynomial factor (optional)
3. Which are the difference of two squares
4. Which are trinomial squares
5. Which are general trinomials

E. Distinguishes between the several types of factoring

- F. Combines several types of factoring to produce complete factorization
- G. Solves polynomial equations by using these steps
 - 1. Transforming into standard form
 - 2. Factoring the polynomial
 - 3. Setting each factor equal to zero
- H. Builds equations from given solution sets
- I. Uses factoring in verbal problem solving

CHECKLIST
ALGEBRA I CONTINUUM
Level B

PUPIL

TEACHER

VI. Special Products and Factoring

- A. Defines terms related to this unit
- B. Factors monomials
- C. Computes special products such as
 - 1. Squaring a monomial
 - 2. Multiplying the sum and difference of the same two numbers
 - 3. Squaring a binomial
 - 4. Multiplying two binomials at sight (FOIL)
- D. Identifies and factors polynomials
 - 1. With a common monomial factor
 - 2. Which are the difference of two squares
 - 3. Which are trinomial squares
 - 4. Which are general trinomials
- E. Factors polynomial expressions completely
- F. Solves polynomial equations by factoring
- G. Builds equations from given solution sets
- H. Uses factoring in verbal problem solving

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level B

VII. Working with Fractions

A. Defines

- | | |
|------------------------------|--------------------|
| 1. Algebraic fraction | 6. Ratio |
| 2. Complex fraction | 7. Percentage |
| 3. Fractional equation | 8. Base |
| 4. Lowest common denominator | 9. Per cent (rate) |
| 5. Mixed expression | |

B. Writes expressions as fractions

C. Notes any values of the variable for which the fraction is not defined

D. Reduces fractions to lowest terms

E. Has a working knowledge of ratio

1. Recognizes the four equivalent forms of ratio
2. Writes ratios using like units
3. Finds ratio of two variables under given conditions
4. Uses ratio in solving verbal problems

F. Solves percentage problems using the formula

G. Knows and applies rule for multiplication of fractions

H. Multiplies fractions, factoring when necessary, and gives product in lowest terms

I. Divides fractions using factoring when necessary

J. Combines operations of multiplication and division in simplifying fractions

- K. Adds and subtracts fractions
 - 1. With equal denominators
 - 2. With unequal denominators
- L. Interchanges fractions with mixed expressions
- M. Simplifies complex fractions by either of the two methods (optional)
- N. Solves open sentences
 - 1. With fractional coefficients
 - 2. Which are fractional equations
 - 3. Which are formed from verbal problems such as
 - a. Investment
 - b. Per cent mixture
 - c. Work
 - d. Motion

CHECKLIST
ALGEBRA I CONTINUUM
Level B

PUPIL

TEACHER

VII. Working with Fractions

- A. Defines terms pertaining to this unit
- B. Writes expressions as fractions, noting restrictions on the variable
- C. Reduces fractions to lowest terms
- D. Demonstrates an understanding of ratio
- E. Solves percentage problems using the formula
- F. Multiplies fractions using factoring when necessary
- G. Divides fractions using factoring when necessary
- H. Combines multiplication and division in simplifying fractions
- I. Adds and subtracts fractions
- J. Interchanges fractions with mixed expressions
- K. Solves open sentences containing fractions
- L. Solves verbal sentences containing fractions

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level B

VIII. Graphs

A. Defines

- | | |
|---------------------------------|----------------------------|
| 1. Ordered pair of numbers | 9. Plane coordinate system |
| 2. Abscissa (first coordinate) | 10. Quadrant |
| 3. Ordinate (second coordinate) | 11. Slope |
| 4. Coordinates of a point | 12. Y-intercept |
| 5. Horizontal axis | 13. Graph |
| 6. Vertical axis | 14. Half-plane |
| 7. Origin | 15. Boundary line |
| 8. Parallel lines | |

B. Solves equations involving ordered pairs

C. Names and plots points in a coordinate plane

D. Recognizes that the graphs of linear equations in two variables form straight lines

E. Graphs linear equations in two variables

1. By using tables
2. By slope-intercept method
3. By point-slope method
4. By using two points

F. Determines slopes of linear graphs

G. Notes that parallel lines have equal slopes

H. Forms equation of a line when given

1. A point and the slope

2. Two points
 - I. Forms the equation of a line parallel to a given line through a given point
 - J. Graphs linear inequalities in two variables
 - K. Recognizes forms of equations that produce
 1. Horizontal graphs
 2. Vertical graphs
 3. Graphs containing the origin

CHECKLIST
ALGEBRA I CONTINUUM
Level B

PUPIL

TEACHER

VIII. Graphs

- ___ A. Defines terms contained in this unit
- ___ B. Solves equations involving ordered pairs
- ___ C. Names and plots points in a coordinate plane
- ___ D. Graphs linear equations in two variables
- ___ E. Determines slopes of linear graphs
- ___ F. Forms equation of a line under given conditions
- ___ G. Graphs linear inequalities in two variables

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level B

IX. Linear Sentences in Two Variables

A. Defines

1. Systems of simultaneous equations
2. Inconsistent equations
3. Independent equations
4. Dependent equations
5. Point of intersection
6. Coincide

B. Determines by inspection whether a system of equations is dependent, independent, or inconsistent

C. Solves systems of equations by

1. Graphing
2. Addition-subtraction method
3. Substitution

D. Uses two variables to solve verbal problems such as

1. Number relations
2. Digit
3. Motion
4. Age
5. Numerator-denominator relations

CHECKLIST
ALGEBRA I CONTINUUM
Level B

PUPIL

TEACHER

IX. Linear Sentences in Two Variables

- ___ A. Identifies terms
- ___ B. Determines by inspection whether a system is dependent, independent, or inconsistent
- C. Solves systems of equations by
 - ___ 1. Graphing
 - ___ 2. Addition-subtraction method
 - ___ 3. Substitution
- ___ D. Uses two variables to solve verbal problems

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA I CONTINUUM

Level B

X. The Real Numbers

A. Defines

- | | |
|------------------------|----------------------|
| 1. Real number system | 8. Index number |
| 2. Rational number | 9. Radicand |
| 3. Terminating decimal | 10. Principal root |
| 4. Repeating decimal | 11. Radical equation |
| 5. Irrational number | 12. Hypotenuse |
| 6. Radical | 13. Conjugate |
| 7. Like radicals | |

B. Recognizes and uses the density property and the order property of rational numbers

C. Performs operations with rational numbers such as

1. Interchanging fractions with decimals
2. Locating numbers between given numbers
3. Rounding off to a designated degree of accuracy

D. Determines square roots by

1. Inspection
2. Product property of square roots
3. Quotient property of square roots

E. Distinguishes between rational and irrational numbers

F. Demonstrates an understanding of the property of completeness for real numbers

- G. Extracts square roots using
 - 1. Approximation method
 - 2. Tables
 - 3. Traditional method
- H. Has a working knowledge of the Pythagorean theorem
- I. Identifies the simplest form of a radical expression
- J. Performs operations with radicals such as
 - 1. Multiplication
 - 2. Division
 - 3. Rationalizing the denominator (conjugate)
 - 4. Simplification
- K. Adds and subtracts radicals
- L. Multiplies binomials containing radicals
- M. Solves and checks radical equations
- N. Solves verbal problems containing radicals
- O. Learns by rote the quadratic formula
- P. Uses quadratic formula in solving equations

CHECKLIST
ALGEBRA I CONTINUUM
Level B

PUPIL

TEACHER

X. The Real Numbers

- A. Defines necessary terms
- B. Performs operations with rational numbers such as
 - 1. Interchanging fractions with decimals
 - 2. Locating numbers between given numbers
 - 3. Rounding off
- C. Expresses radicals in simplest form
- D. Extracts square roots
- E. Has a working knowledge of the Pythagorean theorem
- F. Multiplies and divides radicals
- G. Adds and subtracts radicals
- H. Multiplies binomials containing radicals
- I. Solves radical equations
- J. Solves verbal problems containing radicals
- K. States and uses the quadratic formula

ENRICHMENT FOR ALGEBRA I

- I. Quadratic Relations (See pages 46, 49 in the guide)
 - A. Graphs parabolas
 - B. Solves quadratics by
 - 1. Graphing
 - 2. Completing the square
 - 3. Formula
 - C. Determines nature of roots by use of discriminant
- II. Variation (pages 43, 49)
 - A. Distinguishes between direct, inverse, and combined (joint) variation
 - B. Works problems involving the various types of variation
- III. Factor Theorem and Remainder Theorem (page 39)
- IV. Modular Arithmetic
- V. Relations and Functions (page 43)
- VI. Complex Numbers (page 56)

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

LEVEL A AND LEVEL B

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level A

I. Sets of Numbers; Axioms

A. Defines

1. Real numbers
2. Unique
3. Hypothesis
4. Conclusion
5. Theorem

B. Reviews sets, set vocabulary, and set operations

C. Applies previous knowledge of the properties of real numbers to

1. Graph on number line
2. Add and subtract real numbers
3. Multiply and divide real numbers
4. Find solution sets
5. Supply reasons in a given proof
6. Develop original proofs
7. Evaluate numerical expressions

CHECKLIST
ALGEBRA II CONTINUUM
Level A

PUPIL

TEACHER

I. Sets of Numbers; Axioms

- A. Defines terms in unit
- B. Demonstrates knowledge of sets, set vocabulary, and set operations
- C. Uses properties of real numbers to
 - 1. Graph on number line
 - 2. Add and subtract real numbers
 - 3. Multiply and divide real numbers
 - 4. Find solution sets
 - 5. Supply reasons in a given proof
 - 6. Develop original proofs
 - 7. Evaluate numerical expressions

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level A

II. Open Sentences in One Variable

A. Defines

1. Converse
2. Straight angle
3. Identity

B. Reviews fundamental algebraic operations such as

1. Degree of polynomial
2. Combining like terms
3. Simplifying polynomial expressions
4. Evaluating expressions and sentences
5. Solving equations and inequalities

C. Works with combinations of open sentences using

1. Absolute value
2. Union and intersection
3. Graphing on real number line
4. Venn diagrams
5. Roster

D. Knows and applies zero product-factor theorem

E. Increases proficiency in solving verbal problems

CHECKLIST
ALGEBRA II CONTINUUM
Level A

_____ PUPIL

_____ TEACHER

II. Open Sentences in One Variable

- _____ A. Defines terms associated with this unit
- _____ B. Has a working knowledge of fundamental algebraic operations such as
 - _____ 1. Degree of polynomial
 - _____ 2. Combining like terms
 - _____ 3. Simplifying polynomial expressions
 - _____ 4. Evaluating expressions and sentences
 - _____ 5. Solving equations and inequalities
- _____ C. Works with combinations of open sentences using
 - _____ 1. Absolute value
 - _____ 2. Union and intersection
 - _____ 3. Graphing on real number line
 - _____ 4. Venn diagrams
 - _____ 5. Roster
- _____ D. Knows and applies zero product-factor theorem
- _____ E. Solves verbal problems

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level A

III. Systems of Linear Open Sentences

A. Defines

1. Equal ordered pairs
2. Cartesian coordinate system
3. Y-intercept
4. X-intercept
5. Linear combination

B. Names coordinates which satisfy a given algebraic condition

C. States coordinates of x- and y-intercepts of a linear equation by inspection

D. Determines the slope of a line

1. By inspection
2. When given two points of the line
3. When given the equation of the line

E. Graphs equations

1. Using x- and y-intercepts
2. Using any two points
3. Using a point and the slope of the line
4. Using tables
5. Involving absolute value

F. Writes equation of a line

1. Using point-slope form
 2. Using slope-intercept form
 3. Using two-point formula
 4. Through a given point and parallel to a given line
- G. States whether equations are dependent, inconsistent, or independent
- H. Solves systems of linear equations by
1. Graphing
 2. Linear combination (addition-subtraction)
 3. Substitution
- I. Solves and checks verbal problems using two variables
- J. Graphs linear inequalities and systems of inequalities

CHECKLIST
ALGEBRA II CONTINUUM

Level A

PUPIL

TEACHER

III. Systems of Linear Open Sentences

- ___ A. Defines needed terms
- ___ B. States coordinates
 - ___ 1. Which satisfy a given algebraic condition
 - ___ 2. Of x - and y -intercepts
- ___ C. Determines the slope of a line
- ___ D. Graphs equations
- ___ E. Writes equation of a line
- ___ F. States whether a system of equations is dependent, independent, or inconsistent
- ___ G. Solves systems of linear equations
- ___ H. Solves verbal problems using two variables
- ___ I. Graphs linear inequalities and systems of inequalities

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level A

IV. Polynomials and Factoring

A. Defines

1. Factor set
2. Greatest common factor
3. Least common multiple
4. Irreducible polynomial (prime)
5. Integral multiple

B. Uses rules of exponents to perform indicated operations

C. Reviews rules for multiplication and multiplies polynomials

D. Factors polynomials

1. Over the set of primes
2. To find the greatest common factor and least common multiple
3. By previously learned methods
4. Which are sums or differences of two cubes
5. Which contain a common polynomial factor
6. By using the factor theorem

E. Uses factoring to solve equations and inequalities

F. Uses factoring to solve verbal problems

G. Divides polynomials

1. By traditional method
2. By synthetic division

CHECKLIST
ALGEBRA II CONTINUUM
Level A

PUPIL

TEACHER

IV. Polynomials and Factoring

- A. Defines terms used in this unit
- B. Uses rules of exponents to perform indicated operations
- C. Multiplies polynomials
- D. Factors polynomials completely
- E. Uses factoring to solve equations and inequalities
- F. Solves verbal problems by factoring
- G. Divides polynomials

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level A

V. Rational Numbers and Expressions

A. Defines

1. Complex fraction
2. Scientific notation (standard)
3. Significant digits

B. Simplifies expressions containing exponents by using

1. Previously learned rules
2. Rules for negative and zero exponents

C. Writes rational algebraic expressions noting restrictions

D. Simplifies rational expressions

E. Multiplies and divides rational expressions

F. Adds and subtracts rational expressions

G. Simplifies complex fractions

H. Solves equations and inequalities such as

1. Rational equations and inequalities
2. Fractional equations
3. Systems of equations and inequalities containing fractions
4. Those in verbal form

I. Equates common fractions with rational decimal fractions

J. Uses rules to state the number of significant digits

K. Interchanges scientific notation with decimal form or ordinary notation

L. Rounds off to a given number of significant digits

CHECKLIST
ALGEBRA II CONTINUUM
Level A

PUPIL

TEACHER

V. Rational Numbers and Expressions

- A. Defines terms pertaining to this unit
- B. Simplifies expressions containing exponents
- C. Writes rational algebraic expressions noting restrictions
- D. Simplifies rational expressions
- E. Multiplies and divides rational expressions
- F. Adds and subtracts rational expressions
- G. Simplifies complex fractions
- H. Solves equations and inequalities containing fractions
- I. Equates common fractions with rational decimal fractions
- J. States the number of significant digits
- K. Interchanges scientific notation with decimal form or ordinary notation
- L. Rounds off to a given number of significant digits

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level A

VI. Relations and Functions

A. Defines

- | | |
|------------------------|------------------------|
| 1. Relation | 8. Linear function |
| 2. Domain | 9. Direct variation |
| 3. Range | 10. Proportion |
| 4. Function | 11. Extremes |
| 5. $f(x)$ | 12. Means |
| 6. Constant function | 13. Quadratic function |
| 7. Polynomial function | 14. Vertex |

B. Specifies domain and range of a relation and makes the graph

C. Selects functions from given relations

D. Evaluates functions when given a replacement for x in $f(x)$

E. Writes proportions and solves problems involving direct variation

F. Graphs special functions and relations (optional)

G. Demonstrates knowledge of symmetry with respect to a line

H. Graphs quadratic functions of the form

1. $y = ax^2 + bx + c$

2. $y = a(x-h)^2 + k$

I. Determines from a quadratic function

1. The equation of the axis of symmetry

2. The coordinates of the vertex

3. Whether the vertex is a maximum or a minimum point
4. The maximum or minimum value of the function
- J. Converts quadratic functions of the form $y = ax^2 + bx + c$ into the form $y = a(x-h)^2 + k$ by completing the square
- K. Graphs quadratic inequalities

CHECKLIST
ALGEBRA II CONTINUUM
Level A

PUPIL

TEACHER

VI. Relations and Functions

- A. Defines terms used in this unit
- B. Specifies domain and range of a relation and makes the graph
- C. Selects functions from given relations
- D. Evaluates functions when given a replacement for x in $f(x)$
- E. Writes proportions and solves problems involving direct variation
- F. Demonstrates knowledge of symmetry with respect to a line
- G. Graphs quadratic functions
- H. Has a working knowledge of symmetry and maximum and minimum points in quadratic functions
- I. Converts quadratic functions from one standard form to another
- J. Graphs quadratic inequalities

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level B

VII. Irrational Numbers and Quadratic Equations

A. Defines

1. n^{th} root
2. Cube root
3. Leading coefficient
4. Sum property of roots
5. Product property of roots
6. Discriminant
7. Zero of a function
8. Decimal representation of a rational number
9. Irrational number

B. Determines the number and nature of real n^{th} roots of a given number

C. Solves equations by extracting real roots

D. States restrictions on the values of the variables so that radicals denote real numbers

E. Knows and uses the theorem for determining rational roots

F. Recognizes and uses the facts that

1. Rational operations performed on rational and irrational numbers give an irrational number
2. Rational operations performed on two irrational numbers may give either a rational or an irrational number

G. Distinguishes between rational and irrational numbers

H. Demonstrates a knowledge of and applies rules for simplifying radicals

I. Simplifies sums and differences involving radicals

J. Determines the real roots of equations involving radicals or powers

- K. Multiplies polynomials containing radicals
- L. Rationalizes denominator in simplifying radicals
- M. Solves quadratic equations by
 - 1. Completing the square
 - 2. Quadratic formula
- N. Gives the sum and product of the roots of quadratic equations by inspection
- O. Uses the sum and product properties of roots to form quadratic equations having a given solution set
- P. Uses discriminant to determine the number and nature of real roots of quadratic equations with rational coefficients
- Q. Determines the solution set of an inequality and shows its graph on a number line
- R. Solves and checks radical (irrational) equations

CHECKLIST
ALGEBRA II CONTINUUM
Level B

_____ PUPIL

_____ TEACHER

VII. Irrational Numbers and Quadratic Equations

- _____ A. Defines terms contained in this unit
- _____ B. Determines number and nature of real n^{th} roots of a given number
- _____ C. Solves equations by extracting roots
- _____ D. States restrictions on values of variables so that radicals denote real numbers
- _____ E. Determines rational roots of equations
- _____ F. Recognizes the result of combining a rational with an irrational and of combining two irrational numbers
- _____ G. Distinguishes between rational and irrational numbers
- _____ H. Simplifies radicals
- _____ I. Adds and subtracts radicals
- _____ J. Solves equations involving radicals or powers
- _____ K. Multiplies polynomials containing radicals
- _____ L. Rationalizes denominator
- _____ M. Solves quadratic equations
- _____ N. Knows and uses sum and product properties of roots
- _____ O. Determines number and nature of real roots of quadratic equations
- _____ P. Solves inequalities and graphs solution set on number line
- _____ Q. Solves radical equations

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level B

VIII. Quadratic Relations and Systems

A. Defines

- | | |
|-----------------|-----------------------|
| 1. Parabola | 6. Hyperbola |
| 2. Focus | 7. Asymptote |
| 3. Directrix | 8. Inverse variation |
| 4. Ellipse | 9. Combined variation |
| 5. Focal radius | |

B. Has a working knowledge of the distance formula, the midpoint formula, and the Pythagorean theorem

C. Realizes that the product of the slopes of perpendicular lines is -1

D. Forms the equation of a line through a given point and perpendicular to a given line

E. Recognizes that $(x-h)^2 + (y-k)^2 = r^2$ is an equation of a circle with radius r and center (h,k)

F. Writes equation of a circle given

1. Center and radius
2. Center and a point on the circle

G. Graphs circles by plotting and by sketching

H. Recognizes standard forms of parabolas

I. Graphs parabolas by plotting points

J. Determines the equation of a parabola given the focus and directrix

K. Recognizes the standard forms for an ellipse

- L. Sketches an ellipse using x- and y-intercepts
- M. Forms the equation of an ellipse given the foci and the sum of the focal radii
- N. Recognizes the standard forms of hyperbolas
- O. Sketches hyperbolas by using asymptotes and intercepts (vertices)
- P. Tells by inspection of an equation whether it is a circle, parabola, ellipse, or hyperbola
- Q. Finds constant of proportionality and solves inverse variation problems
- R. Solves systems of quadratics by
 - 1. Graphing
 - 2. Substitution
 - 3. Linear combination
- S. Works verbal problems involving systems of quadratic equations

CHECKLIST
ALGEBRA II CONTINUUM
Level B

_____ PUPIL

_____ TEACHER

VIII. Quadratic Relations and Systems

- _____ A. Knows definitions
- _____ B. Has a working knowledge of the distance formula, the midpoint formula, and the Pythagorean theorem
- _____ C. Realizes that the product of the slopes of perpendicular lines is -1
- _____ D. Forms the equation of a line through a given point and perpendicular to a given line
- _____ E. Recognizes that $(x-h)^2 + (y-k)^2 = r^2$ is an equation of a circle with radius r and center (h,k)
- _____ F. Writes equation of a circle
- _____ G. Graphs circles
- _____ H. Recognizes standard forms of parabolas
- _____ I. Graphs parabolas
- _____ J. Determines the equation of a parabola
- _____ K. Recognizes the standard forms for an ellipse
- _____ L. Sketches an ellipse using x - and y -intercepts
- _____ M. Forms the equation of an ellipse
- _____ N. Recognizes the standard forms of hyperbolas
- _____ O. Sketches hyperbolas
- _____ P. Tells by inspection of an equation whether it is a circle, parabola, ellipse, or hyperbola

- ___ Q. Finds constant of proportionality and solves inverse variation problems
- ___ R. Solves systems of quadratics
- ___ S. Works verbal problems

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CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level B

IX. Exponential Functions and Logarithms

A. Defines

- | | |
|-------------------------|-------------------|
| 1. Exponential function | 6. Mantissa |
| 2. Logarithm | 7. Characteristic |
| 3. Logarithmic function | 8. Antilogarithm |
| 4. Common logarithm | 9. Interpolation |
| 5. Inverse relation | |

B. Knows the rules for working with fractional exponents

C. Uses rules for fractional exponents

1. To interchange radical and exponential forms
2. To simplify expressions
3. To solve equations

D. Graphs exponential and logarithmic functions (optional)

E. Equates exponential and logarithmic functions

F. States the characteristic of the logarithm by inspection and determines the mantissa from tables

G. Finds antilogarithm from tables and places decimal by inspection

H. Realizes that rules for computing with logarithms are basically the same as those for exponents

I. Multiplies, divides, raises to a power, and finds roots of numbers using logarithms

J. Solves and checks equations written in logarithmic or exponential form

K. Solves verbal problems using logarithms to shorten computation

CHECKLIST
ALGEBRA II CONTINUUM
Level B

PUPIL

TEACHER

IX. Exponential Functions and Logarithms

- ___ A. Defines terms used in this unit
- ___ B. Knows and uses the rules for fractional exponents
- ___ C. Equates exponential and logarithmic functions
- ___ D. Finds logarithms
- ___ E. Finds antilogarithms
- ___ F. Uses logarithms to
 - ___ 1. Multiply
 - ___ 2. Divide
 - ___ 3. Raise to a power
 - ___ 4. Find roots of numbers
- ___ G. Solves and checks equations written in logarithmic or exponential form
- ___ H. Solves verbal problems using logarithms

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level B

X. Complex Numbers

A. Defines

1. Imaginary number
2. Pure imaginary number
3. Complex number
4. Equality of complex numbers
5. Vector

B. Plots numbers in complex plane

C. Adds and subtracts complex numbers using the rule for addition

D. Solves equations containing complex numbers

E. Displays a knowledge of

1. Identity elements
2. Additive inverse
3. The repeating pattern of the successive powers of i

F. Simplifies a square root radical whose radicand is negative

G. Multiplies and divides complex numbers using the definition of multiplication and the concept of conjugate when necessary

H. Solves equations over the set of complex numbers

CHECKLIST
ALGEBRA II CONTINUUM
Level B

_____ PUPIL

_____ TEACHER

X. Complex Numbers

- _____ A. Defines terms associated with this unit
- _____ B. Plots numbers in complex plane
- _____ C. Adds and subtracts complex numbers
- _____ D. Solves equations containing complex numbers
- _____ E. Displays a knowledge of
 - _____ 1. Identity elements
 - _____ 2. Additive inverse
 - _____ 3. Repeating pattern of the successive powers of i
- _____ F. Simplifies a square root radical whose radicand is negative
- _____ G. Multiplies and divides complex numbers
- _____ H. Solves equations over the set of complex numbers

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level B

- *XI. Trigonometric Functions, Identities, Formulas, and Circular Functions
- A. Reads positive and negative angles using appropriate terminology
 - B. Demonstrates a working knowledge of the six trigonometric functions
 - C. States by rote the numerical values of trigonometric functions of special angles
 - D. Finds values of trigonometric functions by use of tables
 - E. Expresses any angle as a function of a positive acute angle (reference angle)
 - F. Recognizes fundamental identities
 - G. Sketches graphs of trigonometric functions

*This unit is suggested for those high schools that do not teach trigonometry.

CHECKLIST
ALGEBRA II CONTINUUM
Level B

PUPIL

TEACHER

XI. Trigonometric Functions, Identities, Formulas, and Circular Functions

- A. Reads positive and negative angles
- B. Knows and uses the six trigonometric functions
- C. States by rote the numerical values of trigonometric functions of special angles
- D. Uses tables of trigonometric functions
- E. Expresses an angle as a function of a positive acute angle (reference angle)
- F. Recognizes fundamental identities
- G. Graphs trigonometric functions

CURRICULUM GUIDE FOR MATHEMATICS

ALGEBRA II CONTINUUM

Level B

XII. Progressions and Binomial Expansions

A. Defines

1. Sequence
2. Term (of a sequence)
3. Arithmetic progression
4. Finite sequence
5. Infinite sequence
6. Arithmetic means
7. Geometric mean (mean proportional)
8. Series
9. Summation
10. Geometric progression
11. Factorial notation

B. Knows and uses symbols, abbreviations, and formulas associated with progressions

C. Writes terms of arithmetic progression and finds the n th term

D. Finds and inserts a given number of arithmetic means

E. Finds sums of arithmetic progressions

F. Solves problems involving arithmetic progressions

G. Writes terms of geometric progressions and finds n th term

H. Finds and inserts a designated number of geometric means

I. Finds sums of geometric progressions

- J. Solves verbal problems involving geometric progressions
- K. Expands binomials by using Binomial Theorem
- L. Finds and simplifies a specified term of a binomial expansion

CHECKLIST
ALGEBRA II CONTINUUM
Level B

_____ PUPIL

_____ TEACHER

XII. Progressions and Binomial Expansions

- _____ A. Defines terms in this unit
- _____ B. Knows and uses symbols, abbreviations, and formulas
- _____ C. Writes terms of arithmetic progression and finds the n^{th} term
- _____ D. Finds and inserts a given number of arithmetic means
- _____ E. Finds sums of arithmetic progressions
- _____ F. Solves problems on arithmetic progressions
- _____ G. Writes terms of geometric progressions and finds n^{th} term
- _____ H. Finds and inserts a designated number of geometric means
- _____ I. Finds sums of geometric progressions
- _____ J. Solves problems using geometric progressions
- _____ K. Expands binomials
- _____ L. Finds and simplifies a specified term of a binomial expansion

ENRICHMENT

- I. Polynomial Functions
- II. Matrices and Determinants (See page 128 in the guide)
- III. Permutations, Combinations, and Problems (pages 130 and 132)

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level A and Level B

INTRODUCTION

Although this curriculum guide is mainly self-explanatory, the teacher may find helpful the information that follows.

Because there are so many definitions, symbols, and abbreviations used in geometry, the committee felt it inadvisable to list all of them. Yet, because they are so essential to the mastery of geometry, a reminder to the teacher is placed at the beginning of each unit.

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level A

I. Elements of Geometry

- A. Demonstrates a detailed knowledge of all the terms and definitions needed
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Describes basic undefined terms used
- D. Applies the concept of one-to-one correspondence and the order property of numbers on the real number line
- E. Works with absolute value to
 - 1. Determine distance between two points on the number line
 - 2. Determine the measure of an angle
 - 3. Solve problems
- F. Identifies and draws intersections of
 - 1. Two lines
 - 2. Line and plane
 - 3. Two planes
- G. Has a working knowledge of line segments, rays, and terms associated with them
- H. Demonstrates an understanding of angles and related terms
- I. Determines measure of angles by computation and by use of protractor
- J. Classifies angles by measure or relationship
 - 1. Acute
 - 2. Right
 - 3. Obtuse
 - 4. Straight
 - 5. Equal
 - 6. Adjacent

- 7. Vertical
- 8. Complementary
- 9. Supplementary
- 10. Dihedral
- K. Applies knowledge of angles to problem solving

CHECKLIST
GEOMETRY CONTINUUM
Level A

PUPIL

TEACHER

I. Elements of Geometry

- A. Demonstrates knowledge of terms and definitions needed
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Describes basic undefined terms used
- D. Applies the concept of one-to-one correspondence and the order property of numbers
- E. Works with absolute value
- F. Identifies and draws intersections of
 - 1. Two lines
 - 2. Line and plane
 - 3. Two planes
- G. Has a working knowledge of line segments, rays, and terms associated with them
- H. Demonstrates an understanding of angles and related terms
- I. Measures angles by computation and use of protractor
- J. Classifies angles by measure or relationship
- K. Solves problems involving angle measures

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level A

II. Induction, A Method of Discovery

- A. Demonstrates a detailed knowledge of all the terms and definitions used
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Distinguishes between induction and intuition and draws conclusions when possible
- D. Identifies special segments and angles related to a triangle
 - 1. Exterior angle
 - 2. Remote interior angles
 - 3. Hypotenuse
 - 4. Legs
 - 5. Altitude
 - 6. Perpendicular bisector
 - 7. Bisector of an angle
 - 8. Median
- E. Classifies triangles according to sides or angles
- F. Distinguishes between polygons and other geometric figures
- G. Classifies special types of polygons
- H. Works problems involving angle measures in polygons
- I. Defines and classifies quadrilaterals and related terms
- J. Discovers relationships of polygons and related segments by drawing diagrams
- K. Demonstrates a knowledge of the circle and its related points, lines, and segments
- L. Identifies and illustrates circles in relation to other figures
- M. Distinguishes between spheres and circles
- N. Demonstrates a knowledge of the sphere and its related points, lines, segments, and planes

CHECKLIST
GEOMETRY CONTINUUM

Level A

PUPIL

TEACHER

II. Induction, A Method of Discovery

- A. Demonstrates a detailed knowledge of all the terms and definitions used
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Distinguishes between induction and intuition and draws conclusions when possible
- D. Identifies special segments and angles related to a triangle
- E. Classifies triangles according to sides or angles
- F. Distinguishes between polygons and other geometric figures
- G. Classifies special types of polygons
- H. Works problems involving angle measures in polygons
- I. Defines and classifies quadrilaterals and related terms
- J. Discovers relationships of polygons and related segments by drawing diagrams
- K. Demonstrates a knowledge of the circle and its related points, lines, and segments
- L. Identifies and illustrates circles in relation to other figures
- M. Distinguishes between spheres and circles
- N. Demonstrates a knowledge of the sphere and its related points, lines, segments, and planes

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level A

III. Deduction and Proof

- A. Demonstrates a detailed knowledge of all the terms and definitions needed
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Distinguishes between deduction and other types of thinking
- D. Identifies hypothesis and conclusion and expresses statements in "if-then" form
- E. Draws conclusions based on deduction
- F. Discovers the relationship between a given statement, its converse, its inverse, and its contrapositive (optional)
- G. Recognizes a good definition
- H. Knows and uses the properties of the real number system
- I. States by rote the postulates and theorems concerning points, lines, and planes
- J. Selects the postulate or theorem which justifies a given statement
- K. Extends the application of postulates and theorems to the number line
- L. Studies sample proofs in preparation for original proofs
- M. Draws and labels a diagram for each geometric proof
- N. Writes simple proofs, noting that only definitions, postulates, or previously proved theorems are acceptable to support assertions

CHECKLIST
GEOMETRY CONTINUUM

Level A

PUPIL

TEACHER

III. Deduction and Proof

- A. Demonstrates a detailed knowledge of all the terms and definitions needed
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Distinguishes between deduction and other types of thinking and draws conclusions based on deduction
- D. Identifies hypothesis and conclusion and expresses statements in "if-then" form
- E. Knows and uses the properties of the real number system
- F. States by rote the postulates and theorems concerning points, lines, and planes
- G. Selects the postulate or theorem which justifies a given statement
- H. Extends the application of postulates and theorems to the number line
- I. Writes simple proofs including diagrams if needed

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level A

IV. Angle Relationships; Perpendicular Lines

- A. Demonstrates a working knowledge of postulates relating to angles
- B. Defines betweenness of rays
- C. Knows and uses theorems of this unit in solving problems and constructing proofs
- D. Arranges in order the six essential parts in the demonstration of a theorem
- E. Inventories useful statements concerning angles and perpendicular lines
- F. Summarizes methods for proving two angles equal

CHECKLIST
GEOMETRY CONTINUUM

Level A

PUPIL

TEACHER

IV. Angle Relationships; Perpendicular Lines

- A. Demonstrates a working knowledge of postulates relating to angles
- B. Defines betweenness of rays
- C. Knows and uses theorems of this unit in solving problems and constructing proofs
- D. Arranges in order the six essential parts in the demonstration of a theorem
- E. Inventories useful statements concerning angles and perpendicular lines
- F. Summarizes methods for proving two angles equal

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level A

V. Parallel Lines and Planes

- A. Demonstrates a detailed knowledge of all the terms and definitions needed
- B. Recognizes and uses abbreviations and special geometric vocabulary
- C. Uses visual aids and models to better understand the relationships between lines and planes in space
- D. Applies postulates and theorems pertaining to parallel planes and lines in solving problems and constructing proofs
- E. Identifies and works with special angles formed by transversals and parallel lines
- F. Follows the suggested form in developing an indirect proof
- G. States by rote the Parallel Postulate
- H. Draws and uses auxiliary lines
- I. Proves that lines are parallel if
 - 1. Corresponding angles are equal
 - 2. Alternate interior angles are equal
 - 3. In a plane, two lines are perpendicular to a third line
 - 4. Two interior angles on the same side of the transversal are supplementary
- J. Demonstrates a working knowledge of the angle relationships in triangles such as
 - 1. Sum of the angles of a triangle
 - 2. Measure of an angle of an equiangular triangle
 - 3. Measure of exterior angle of a triangle

CHECKLIST
GEOMETRY CONTINUUM

Level A

PUPIL

TEACHER

V. Parallel Lines and Planes

- A. Demonstrates a detailed knowledge of all terms and definitions needed
- B. Recognizes and uses abbreviations and special geometric vocabulary
- C. Applies postulates and theorems pertaining to parallel planes and lines in solving problems and constructing proofs
- D. Identifies and works with special angles formed by transversals and parallel lines
- E. Follows the suggested form in developing an indirect proof
- F. States by rote the Parallel Postulate
- G. Proves that lines are parallel
- H. Demonstrates a working knowledge of the angle relationships in triangles

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level B

VI. Congruent Triangles

- A. Demonstrates a detailed knowledge of all terms and definitions needed
- B. Recognizes and uses abbreviations, symbols, and geometric vocabulary
- C. Identifies corresponding parts of two triangles
- D. Explores the concept of congruence
- E. Proves triangles congruent by
 - 1. SSS
 - 2. SAS
 - 3. ASA
 - 4. AAS
- F. Proves right triangles congruent by
 - 1. HL
 - 2. LL
 - 3. HA
 - 4. LA
- G. Uses congruent triangles to prove corresponding parts equal (CPCTE)
- H. Realizes that an auxiliary line is determined if exactly one line can be drawn to meet the conditions
- I. Knows and uses the theorem and its converse concerning base angles of an isosceles triangle
- J. Knows and applies the meaning of the word distance
 - 1. From a point to a line (or a plane)
 - 2. Between two parallel lines
 - 3. From a point to a figure

- K. Summarizes and uses defined and proved properties of quadrilaterals
1. Isosceles trapezoid
 2. Parallelogram
 3. Rectangle
 4. Rhombus
 5. Square
- L. Discusses practical applications of congruent triangles

CHECKLIST
GEOMETRY CONTINUUM

Level B

PUPIL

TEACHER

VI. Congruent Triangles

- A. Demonstrates knowledge of terms and definitions
- B. Recognizes and uses abbreviations, symbols, and geometric vocabulary
- C. Identifies corresponding parts of two triangles
- D. Proves triangles congruent
- E. Uses congruent triangles to prove corresponding parts equal
- F. Realizes that an auxiliary line is determined if exactly one line can be drawn to meet the conditions
- G. Knows and uses the theorem and its converse concerning base angles of an isosceles triangle
- H. Knows and applies the meaning of the word distance
- I. Summarizes and uses properties of various quadrilaterals

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level B

VII. Similar Polygons

- A. Demonstrates a detailed knowledge of all the terms and definitions needed
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Uses ratio and proportion in problem solving
- D. Recognizes and uses special properties of a proportion
 - 1. Means-extremes product property
 - 2. Equivalent-form property
 - 3. Denominator-addition property
 - 4. Denominator-subtraction property
 - 5. Numerator-denominator sum property of equal ratios
- E. Demonstrates an understanding of the meaning and use of similarity in polygons
- F. Proves triangles similar and uses the concept of similarity in problem solving
- G. Knows and applies relationships of special segments in a triangle
- H. Describes the projection of a point on a line and a segment on a line in the same plane
- I. Discovers and applies the relationships which exist when an altitude is drawn to the hypotenuse of a right triangle
- J. Relates a knowledge of the Pythagorean Theorem and its converse to problem solving
- K. Extends the application of the Pythagorean Theorem to
 - 1. The 30-60-90 triangle

2. The 45-45-90 triangle
 3. The easily recognized Pythagorean triples such as $3n$, $4n$, $5n$ and $5n$, $12n$, $13n$
- L. Visualizes three-dimensional figures and works problems using the Pythagorean Theorem

CHECKLIST
GEOMETRY CONTINUUM

Level B

PUPIL

TEACHER

VII. Similar Polygons

- ___ A. Demonstrates a detailed knowledge of all the terms and definitions needed
- ___ B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- ___ C. Uses ratio and proportion to solve problems
- ___ D. Recognizes and uses special properties of a proportion
- ___ E. Demonstrates an understanding of the meaning and use of similarity in polygons
- ___ F. Proves triangles similar and uses the concept of similarity in problem solving
- ___ G. Knows and applies relationships of special segments in a triangle
- ___ H. Describes projections of points and segments
- ___ I. Applies the relationships which exist when an altitude is drawn to the hypotenuse of a right triangle
- ___ J. Relates a knowledge of the Pythagorean Theorem and its converse to problem solving
- ___ K. Extends the application of the Pythagorean Theorem to special triangles
- ___ L. Visualizes three-dimensional figures and works problems using the Pythagorean Theorem

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level B

VIII. Circles, Arcs and Angles

- A. Demonstrates a detailed knowledge of all the terms and definitions needed
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Interprets the Arc-Addition Postulate
- D. States and uses the relationship between central angles and their arcs
- E. Measures angles that are
 - 1. Inscribed in circles
 - 2. Formed by a tangent and a secant drawn from a point on a circle
 - 3. Formed by two secants, or two tangents, or a secant and a tangent intersecting outside a circle
 - 4. Formed by two secants intersecting within a circle
- F. Extends the concept of angle measurement to include
 - 1. An angle inscribed in a semicircle
 - 2. A quadrilateral inscribed in a circle
 - 3. Inscribed angles intercepting the same or equal arcs
 - 4. A diameter drawn to a point of contact
- G. Applies the theorem that a diameter perpendicular to a chord bisects the chord and its two arcs
- H. Determines lengths of line segments and derives proofs when
 - 1. Two chords intersect within a circle
 - 2. Two secants, or a tangent and a secant, are drawn to a circle from an outside point

CHECKLIST

GEOMETRY CONTINUUM

Level B

PUPIL

TEACHER

VIII. Circles, Arcs, and Angles

- ____ A. Demonstrates a detailed knowledge of all the terms and definitions needed
- ____ B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- ____ C. Interprets the Arc-Addition Postulate
- ____ D. States and uses the relationship between central angles and their arcs
- ____ E. Measures angles that are
 - ____ 1. Inscribed in circles
 - ____ 2. Formed by a tangent and a secant drawn from a point on a circle
 - ____ 3. Formed by two secants, or two tangents, or a secant and a tangent intersecting outside a circle
 - ____ 4. Formed by two secants intersecting within a circle
- ____ F. Extends the concept of angle measurement to include
 - ____ 1. An angle inscribed in a semicircle
 - ____ 2. A quadrilateral inscribed in a circle
 - ____ 3. Inscribed angles intercepting the same or equal arcs
 - ____ 4. A diameter drawn to a point of contact
- ____ G. Applies the theorem that a diameter perpendicular to a chord bisects the chord and its two arcs

H. Determines lengths of line segments and derives proofs when

_____ 1. Two chords intersect within a circle

_____ 2. Two secants, or a tangent and a secant, are drawn to a circle from an outside point

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level B

IX. Constructions and Loci

- A. Distinguishes between a drawing and a construction
- B. Recognizes that the unmarked straightedge and a compass are the only instruments used for construction purposes
- C. Illustrates the six parts of a complete solution to a construction problem
 1. A Statement
 2. The Given
 3. The To Construct
 4. The Constructed figure
 5. Steps
 6. Justification
- D. Constructs
 1. An angle equal to a given angle
 2. A ray which bisects a given angle
 3. A segment equal to a given segment
 4. A line perpendicular to a given line at a given point on the line
 5. A perpendicular to a given line from a given point outside the line
 6. The perpendicular bisector of a given segment
 7. A line parallel to a given line through a given point not on the line

8. A line which bisects a given arc of a circle
 9. The tangent to a given circle at a given point of the circle
 10. The tangents to a given circle from a given external point
 11. A circle which circumscribes a given triangle
 12. A circle which is inscribed in a given triangle
- E. Divides a given segment into any given number of equal parts
 - F. Constructs a segment whose length is the fourth proportional to the lengths of three given segments
 - G. Constructs a segment whose length is the mean proportional between the lengths of two given segments
 - H. Defines locus
 - I. Illustrates the solution to a locus problem by the use of a diagram and a word description
 - J. Finds the locus of points which satisfy one or more given conditions
 - K. Determines the solution of construction exercises by means of loci

CHECKLIST
GEOMETRY CONTINUUM

Level B

PUPIL

TEACHER

IX. Constructions and Loci

- A. Distinguishes between a drawing and a construction
- B. Recognizes and uses the only two instruments permissible for construction purposes
- C. Illustrates the six parts of a complete solution to a construction problem
- D. Constructs
 - 1. An angle equal to a given angle
 - 2. A ray which bisects a given angle
 - 3. A segment equal to a given segment
 - 4. A line perpendicular to a given line at a point in the line
 - 5. A perpendicular to a given line from a point outside the line
 - 6. The perpendicular bisector of a segment
 - 7. A line parallel to a given line through a given point not on the line
 - 8. A line which bisects an arc of a circle
 - 9. The tangent to a circle at a given point of the circle
 - 10. The tangents to a given circle from a given external point
 - 11. A circle which circumscribes a given triangle
 - 12. A circle which is inscribed in a given triangle
- E. Divides a given segment into any given number of equal parts
- F. Constructs a segment whose length is the fourth proportional to the lengths of three given segments

- ___ G. Constructs a segment whose length is the mean proportional between the lengths of two given segments
- ___ H. Defines locus
- ___ I. Illustrates the solution to a locus problem using diagram and word description
- ___ J. Finds the locus of points which satisfy one or more given conditions
- ___ K. Solves construction exercises by means of loci

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level B

X. Coordinate Geometry-Methods

- A. Demonstrates a detailed knowledge of all the terms and definitions needed
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Plots points on the number line and in the coordinate plane
- D. Demonstrates a knowledge of symmetry with respect to a point, a line, and a plane
- E. Draws graphs in the coordinate plane using the conditions stated
- F. Calculates by use of formulas
 - 1. The distance between two points
 - 2. The midpoint of the segment joining two points
- G. Recognizes and uses the fact that the circle with center (a,b) and radius r has the equation $(x-a)^2 + (y-b)^2 = r^2$
- H. Finds the slope of a line by use of the formula
- I. Tells whether the slope appears to be positive, negative, zero, or not defined
- J. Specifies the relationship between the slopes of two nonvertical lines as being
 - 1. Equal, if and only if, the lines are parallel
 - 2. Negative reciprocals, if and only if, the lines are perpendicular
- K. Notes the standard linear equation is written in the form $ax + by = c$
- L. Writes the equation of a line
 - 1. When given a point (x_1, y_1) and the slope (m) by using $y - y_1 = m(x - x_1)$

2. When given two points
 3. Through a given point and parallel to a given line
 4. Through a given point and perpendicular to a given line
- M. Solves systems of equations by an algebraic method

CHECKLIST
GEOMETRY CONTINUUM

Level B

PUPIL

TEACHER

X. Coordinate Geometry-Methods

- A. Demonstrates a detailed knowledge of all terms and definitions needed
- B. Recognizes and uses symbols, abbreviations, and special geometric vocabulary
- C. Plots points on the number line and in the coordinate plane
- D. Demonstrates a knowledge of symmetry with respect to a point, a line, and a plane
- E. Draws graphs in the coordinate plane using the conditions stated
- F. Calculates by use of formulas
 - 1. The distance between two points
 - 2. The midpoint of the segment joining two points
- G. Recognizes and uses the fact that the circle with center (a,b) and radius r has the equation $(x-a)^2 + (y-b)^2 = r^2$
- H. Finds the slope of a line by use of the formula
- I. Recognizes the slope as being positive, negative, zero, or not defined
- J. Specifies the relationship between the slopes of two nonvertical lines
- K. Writes the equation of a line
- L. Solves systems of equations by an algebraic method

CURRICULUM GUIDE FOR MATHEMATICS

GEOMETRY CONTINUUM

Level B

XI. Areas and Volumes

- A. Defines terms needed in finding areas
- B. Writes formulas and computes areas of
 - 1. Rectangle
 - 2. Square
 - 3. Parallelogram
 - 4. Triangle
 - 5. Trapezoid
 - 6. Rhombus
 - 7. Regular polygon
 - 8. Circle
- C. Compares areas of two similar polygons
- D. Defines terms needed in finding total (surface) areas and volumes of solids
- E. Writes formulas and computes total areas and volumes of
 - 1. Prism
 - 2. Pyramid
 - 3. Cylinder
 - 4. Cone
 - 5. Sphere
- F. Compares areas and volumes of similar solids

CHECKLIST
GEOMETRY CONTINUUM

Level B

PUPIL

TEACHER

XI. Areas and Volumes

- A. Defines terms needed in finding areas
- B. Writes formulas and computes areas of polygons and circles
- C. Compares areas of two similar polygons
- D. Defines terms needed in finding total areas and volumes of solids
- E. Writes formulas and computes total areas and volumes of solids
- F. Compares areas and volumes of similar solids

ENRICHMENT

- I. Elements of Logic (See page 119 in the guide)
- II. Coordinate Geometry-Proofs
- III. Vectors

CURRICULUM GUIDE FOR MATHEMATICS

TRIGONOMETRY CONTINUUM

CURRICULUM GUIDE FOR MATHEMATICS

TRIGONOMETRY CONTINUUM

- I. Trigonometric Functions for Acute Angles—the Right Triangle
- A. Distinguishes between trigonometric and algebraic functions
 - B. Recognizes that the domain of a trigonometric function is a set of angles
 - C. States by rote the six trigonometric functions of an acute angle in a right triangle
 - D. Discovers which are the increasing and which are the decreasing functions in the first quadrant
 - E. Writes the trigonometric functions in abbreviated form and finds numerical values from tables, interpolating when necessary
 - F. Explains and illustrates angles of elevation and depression
 - G. Sketches diagrams and solves verbal problems using trigonometric ratios
 - H. Finds measure of an angle, given the numerical value of a trigonometric function
 - I. Identifies and uses cofunctions
 - 1. Sine—cosine
 - 2. Tangent—cotangent
 - 3. Secant—cosecant
 - J. Identifies and applies reciprocal functions
 - 1. Sine—cosecant
 - 2. Cosine—secant
 - 3. Tangent—cotangent
 - K. Finds all functions of an angle when one function is given
 - L. Draws a right triangle to find the numerical values of the functions for angles of 30° , 45° , and 60°

- M. Applies from memory the numerical values of the functions of the special angles (30° , 45° , 60°) to simplify expressions and solve problems
- N. Defines vectors
- O. Recognizes and applies the two methods used to express direction or bearing

CHECKLIST
TRIGONOMETRY CONTINUUM

PUPIL

TEACHER

I. Trigonometric Functions for Acute Angles—the Right Triangle

- ____ A. Distinguishes between trigonometric and algebraic functions
- ____ B. Recognizes that the domain of a trigonometric function is a set of angles
- ____ C. States by rote the six trigonometric functions of an acute angle in a right triangle
- ____ D. Knows which are the increasing and which are the decreasing functions in the first quadrant
- ____ E. Writes the trigonometric functions in abbreviated form and finds numerical values from tables
- ____ F. Explains and illustrates angles of elevation and depression
- ____ G. Sketches diagrams and solves verbal problems using trigonometric ratios
- ____ H. Finds measure of an angle, given the numerical value of a trigonometric function
- ____ I. Identifies and uses cofunctions
- ____ J. Identifies and applies reciprocal functions
- ____ K. Finds all functions of an angle when one function is given
- ____ L. Applies from memory the numerical values of the functions of the special angles to simplify expressions and solve problems
- ____ M. Defines vectors
- ____ N. Recognizes and applies the two methods used to express direction or bearing

CURRICULUM GUIDE FOR MATHEMATICS

TRIGONOMETRY CONTINUUM

II. Trigonometric Functions for Angles of any Size

A. Defines

1. General angle
2. Positive angle
3. Negative angle
4. Initial side
5. Terminal side
6. Quadrantal angles
7. Coterminal angles
8. Standard position
9. Radius vector
10. Reference angle
11. Triangle of reference

B. Notes the Greek letters used to represent angles

C. Represents by diagrams angles greater than 360° , angles in standard position, and triangles of reference

D. Knows and uses the signs of the trigonometric functions for any angle

E. Obtains numerical values of functions for angles greater than 90° by either method

F. Converts functions of negative angles to functions of positive angles and finds numerical values

G. States by rote and applies the numerical values of the functions of quadrantal angles

H. Discovers the line representations of the trigonometric functions in terms of a unit circle

I. Has a working knowledge of the limits of variation of the trigonometric functions for angles from 0° to 360°

CHECKLIST
TRIGONOMETRY CONTINUUM

PUPIL

TEACHER

II. Trigonometric Functions

- ____ A. Defines needed terms
- ____ B. Represents angles and triangles by diagrams
- ____ C. Knows and uses the signs of trigonometric functions for any angle
- ____ D. Obtains numerical values of functions for angles greater than 90°
- ____ E. Converts functions of negative angles to functions of positive angles and finds numerical values
- ____ F. Knows and uses numerical values of functions of quadrantal angles
- ____ G. Knows limits of variation of the trigonometric functions for angles from 0° to 360°

CURRICULUM GUIDE FOR MATHEMATICS

TRIGONOMETRY CONTINUUM

III. Circular Measure

A. Defines

- | | |
|----------------------|---------------------|
| 1. Circular measure | 4. Angular velocity |
| 2. Sexagesimal units | 5. Linear velocity |
| 3. Radian | 6. Mil |

B. Knows and uses abbreviations and formulas having to do with circular measure

C. Memorizes conversion units for degrees, mils, and radians

D. Interchanges degrees

1. With π radians
2. With radians
3. With mils

E. Simplifies functions when angle is given in radian measure

F. Solves verbal problems involving

1. Arc length
2. Linear velocity
3. Angular velocity
4. Area of a sector of a circle
5. Angles measured in mils

CHECKLIST
TRIGONOMETRY CONTINUUM

PUPIL

TEACHER

III. Circular Measure

- ____ A. Defines needed terms
- ____ B. Knows and uses abbreviations and formulas
- ____ C. Memorizes conversion units for degrees, mils, and radians
- ____ D. Interchanges degrees
 - ____ 1. With π radians
 - ____ 2. With radians
 - ____ 3. With mils
- ____ E. Simplifies functions when angle is given in radian measure
- ____ F. Solves verbal problems involving
 - ____ 1. Arc length
 - ____ 2. Linear velocity
 - ____ 3. Angular velocity
 - ____ 4. Area of a sector of a circle
 - ____ 5. Angle measures in mils

CURRICULUM GUIDE FOR MATHEMATICS

TRIGONOMETRY CONTINUUM

IV. Graphs; Inverse Functions

A. Defines

- | | |
|----------------------|------------------------|
| 1. Periodic function | 6. Composite graph |
| 2. Period | 7. Inverse function |
| 3. Cycle | 8. Principal value |
| 4. Frequency | 9. Discontinuous |
| 5. Amplitude | 10. Phase displacement |

B. Identifies period and amplitude of trigonometric functions

C. Tells which trigonometric functions have continuous graphs and which have discontinuous graphs

D. Locates points of discontinuity

E. Graphs trigonometric functions by preparing a table of values and by sketching

F. Recognizes and graphs functions which have a phase displacement

G. Plots multiple graphs of trigonometric functions on a plane to determine similarities and variations

1. Between functions and cofunctions
2. Between functions and reciprocal functions
3. Among the six functions

H. Sketches graphs of the form $y = a \sin b\theta$

I. Draws composite graphs

J. Recognizes and uses the two symbols that denote inverse functions

K. Finds positive and negative values of angles, given an inverse function

- L. Graphs inverse functions by preparing a table of values and by sketching
- M. Graphs functions and their inverses in the same plane to determine their similarities and variations

CHECKLIST
TRIGONOMETRY CONTINUUM

PUPIL

TEACHER

IV. Graphs; Inverse Functions

- A. Defines terms needed in this unit
- B. Identifies period and amplitude of trigonometric functions
- C. Recognizes continuity and discontinuity in graphs
- D. Locates points of discontinuity
- E. Graphs trigonometric functions
- F. Recognizes and graphs functions which have a phase displacement
- G. Plots multiple graphs of trigonometric functions to determine similarities and variations
- H. Sketches graphs of the form $y = a \sin b\theta$
- I. Draws composite graphs
- J. Recognizes and uses the two symbols for inverse functions
- K. Finds positive and negative values of angles, given an inverse function
- L. Graphs inverse functions
- M. Graphs functions and their inverses to determine their similarities and variations

CURRICULUM GUIDE FOR MATHEMATICS

TRIGONOMETRY CONTINUUM

V. Trigonometric Equations—Identical and Conditional

- A. Defines and differentiates between identical equations (identities) and conditional equations
- B. States by rote the eight fundamental identities
 - 1. Pythagorean relations
 - 2. Reciprocal relations
 - 3. Quotient relations
- C. Simplifies expressions using the eight fundamental identities
- D. Proves identities using the following suggestions
 - 1. Begins by transforming the more complicated member to a simpler form
 - 2. Makes substitutions from the eight fundamental identities, keeping the expression simplified by means of algebraic reductions
 - 3. Expresses all functions in terms of sines and cosines if no other method is successful
 - 4. Works with each member separately to avoid the common error of assuming the two members are equal
- E. Notes the similarity between algebraic equations and trigonometric equations
- F. Solves trigonometric equations for solutions within a given domain
- G. Notes and rejects apparent roots impossible of interpretation (absurd roots)
- H. Verifies solution set by substitution

CHECKLIST
TRIGONOMETRY CONTINUUM

PUPIL

TEACHER

V. Trigonometric Equations—Identical and Conditional

- A. Defines and differentiates between identical equations and conditional equations
- B. States by rote the eight fundamental identities
- C. Simplifies expressions using the eight fundamental identities
- D. Proves identities
- E. Solves trigonometric equations
- F. Checks for valid roots

CURRICULUM GUIDE FOR MATHEMATICS

TRIGONOMETRY CONTINUUM

VI. Oblique Triangles

- A. Reviews previously learned facts about logarithms as outlined in Algebra II Continuum
- B. Finds logarithms of trigonometric functions from tables
- C. Defines oblique triangle
- D. Commits to memory the law of sines
- E. Recognizes that the law of sines is used in the solution of oblique triangles when given
 - 1. Two angles and a side opposite one of them
 - 2. Two sides and an angle opposite one of them
- F. Tests data before using law of sines to determine whether there will be one solution, two solutions, or no solution
- G. Uses law of sines to solve for the remaining parts of an oblique triangle
- H. Commits to memory the law of cosines
- I. Recognizes that the law of cosines is used in the solution of oblique triangles when given
 - 1. Two sides and the included angle
 - 2. Three sides
- J. Uses law of cosines to solve for the remaining parts of an oblique triangle
- K. Knows formulas and finds areas of triangles when given
 - 1. Two sides and the included angle
 - 2. Three sides
- L. Demonstrates a knowledge of vectors, components, and resultants and applies this knowledge to problem solving

- M. Has a working knowledge of the law of tangents
- N. Recognizes the formulas for functions of half-angles in a triangle
- O. Recognizes that Mollweide's formula can be used to check solutions of oblique triangles
- P. Uses logarithms as an aid in solving oblique triangles

CHECKLIST
TRIGONOMETRY CONTINUUM

PUPIL

TEACHER

VI. Oblique Triangles

- ____ A. Finds logarithms of trigonometric functions
- ____ B. Defines oblique triangle
- ____ C. Knows and uses the law of sines in solving oblique triangles
- ____ D. Tests data to determine number of solutions for an oblique triangle
- ____ E. Knows and uses the law of cosines in solving oblique triangles
- ____ F. Knows formulas and finds areas of oblique triangles
- ____ G. Solves problems about vectors, components, and resultants
- ____ H. Uses logarithms as an aid in solving oblique triangles

CURRICULUM GUIDE FOR MATHEMATICS

TRIGONOMETRY CONTINUUM

VII. Functions of Two Angles

- A. States by rote the formulas for the functions of the sum and difference of two angles
 - 1. Sine
 - 2. Cosine
 - 3. Tangent
- B. Uses the sum and difference formulas to
 - 1. Form equivalent expressions
 - 2. Evaluate expressions
 - 3. Find functions of angles without use of tables
 - 4. Prove identities
 - 5. Solve equations
- C. States by rote the formulas for the functions of twice an angle (double-angle formulas)
 - 1. Sine
 - 2. Cosine (three forms)
 - 3. Tangent
- D. Uses the double-angle formulas to
 - 1. Form equivalent expressions
 - 2. Evaluate expressions
 - 3. Find functions of angles without use of tables
 - 4. Prove identities
 - 5. Solve equations

- E. States by rote the formulas for functions of half-angles (half-angle formulas)
 - 1. Sine
 - 2. Cosine
 - 3. Tangent
- F. Uses the half-angle formulas to
 - 1. Form equivalent expressions
 - 2. Evaluate expressions
 - 3. Find functions of angles without use of tables
 - 4. Prove identities
 - 5. Solve equations
- G. Converts products of functions into sums or differences of functions
- H. Converts sums or differences of functions into products of functions

CHECKLIST
TRIGONOMETRY CONTINUUM

_____ PUPIL

_____ TEACHER

VII. Functions of Two Angles

- _____ A. States by rote the formulas for the functions of the sum and difference of two angles
- _____ B. Uses the sum and difference formulas
- _____ C. States by rote the formulas for the functions of twice an angle
- _____ D. Uses the double-angle formulas
- _____ E. States by rote the formulas for functions of half-angles
- _____ F. Uses the half-angle formulas
- _____ G. Converts products of functions into sums or differences of functions
- _____ H. Converts sums or differences of functions into products of functions

CURRICULUM GUIDE FOR MATHEMATICS

TRIGONOMETRY CONTINUUM

VIII. Complex Numbers and Polar Coordinates

A. Recalls pertinent facts about complex numbers

- | | |
|----------------|---------------------------|
| 1. Definitions | 3. Operations |
| 2. Equality | 4. Graphic representation |

B. Defines

1. Polar coordinate system
2. Polar coordinates (r, θ)
3. Polar form of a complex number $(\text{cis } \theta)$
4. Modulus (absolute value)
5. Amplitude (argument)

C. Derives the relationship between rectangular coordinates (x, y) and polar coordinates (r, θ) from a right triangle diagram

D. Determines modulus and amplitude

E. Writes complex numbers in polar form

F. Obtains polar equivalents for complex numbers

G. Recognizes the advantages of using polar form in finding products, quotients, powers, and roots of complex numbers

H. Applies theorems to multiply or divide complex numbers in polar form

I. Uses De Moivre's Theorem to find powers and roots of complex numbers in polar form

J. Graphs equations in the polar coordinate plane

CHECKLIST
TRIGONOMETRY CONTINUUM

_____ PUPIL

_____ TEACHER

VIII. Complex Numbers and Polar Coordinates

- _____ A. Defines needed terms
- _____ B. Derives the relationship between rectangular coordinates and polar coordinates from a right triangle diagram
- _____ C. Determines modulus and amplitude
- _____ D. Writes complex numbers in polar form
- _____ E. Obtains polar equivalents for complex numbers
- _____ F. Applies theorems to multiply or divide complex numbers in polar form
- _____ G. Uses De Moivre's Theorem to find powers and roots of complex numbers in polar form
- _____ H. Graphs equations in the polar coordinate plane

ENRICHMENT

- I. The Slide Rule
- II. Lines, Circles, and Conics in Polar Coordinates

CURRICULUM GUIDE FOR MATHEMATICS

ADVANCED MATHEMATICS CONTINUUM

CURRICULUM GUIDE FOR MATHEMATICS

ADVANCED MATHEMATICS CONTINUUM

I. Logic

A. Defines

- | | |
|----------------|--------------------|
| 1. Proposition | 9. Abstraction |
| 2. Antecedent | 10. Quantifier |
| 3. Consequent | 11. Tautology |
| 4. Conjunction | 12. Truth table |
| 5. Disjunction | 13. Converse |
| 6. Implication | 14. Inverse |
| 7. Equivalence | 15. Contrapositive |
| 8. Negation | |

B. Recognizes and uses symbols pertaining to logic

C. Examines the logical structure of a mathematical system

D. Combines two propositions to form a conjunction, a disjunction, or an implication

E. Forms the negation of a given proposition

F. Determines under what conditions a conjunction, a disjunction, an implication, or an equivalence is true

G. Recognizes implied or stated quantifiers in mathematical propositions

H. Constructs truth tables to determine whether a proposition is true

I. Uses truth tables to establish rules for negations

J. Writes the negation of a compound proposition

K. Derives implications from other implications

1. Converse

2. Inverse
 3. Contrapositive
- L. Concludes from truth tables that
1. The converse of a true implication is not always true
 2. The inverse of a true implication is not always true
 3. The implication and its contrapositive are simultaneously true or false
- M. Interchanges implications written in the "if-then" form with those written in "sufficient-necessary" form
- N. Constructs direct and indirect proofs for propositions
- O. Recognizes and uses the two methods of disproof
1. Counterexample
 2. Contradiction
- P. Uses logical reasoning to test validity of conclusions
- Q. Supplies necessary propositions to set up a logical structure, or to make a logical sequence

CHECKLIST
ADVANCED MATHEMATICS CONTINUUM

PUPIL

TEACHER

I. Logic

- A. Defines terms used in logic
- B. Recognizes and uses appropriate symbols
- C. Forms conjunctions, disjunctions, implications, and negations
- D. Determines under what conditions a conjunction, a disjunction, an implication, or an equivalence is true
- E. Recognizes implied or stated quantifiers
- F. Constructs and uses truth tables
- G. Writes negation of a compound proposition
- H. Derives implications from other implications
- I. Interchanges implications written in the "if-then" form with those written in "sufficient-necessary" form
- J. Constructs direct and indirect proofs
- K. Recognizes and uses two methods of disproof
- L. Tests validity of conclusions
- M. Supplies necessary propositions to set up a logical structure, or to make a logical sequence

CURRICULUM GUIDE FOR MATHEMATICS
ADVANCED MATHEMATICS CONTINUUM

II. Number Fields

- A. Has a working knowledge of properties of the real number system
- B. Recognizes and uses the properties of zero in division
 - 1. If $a \neq 0$, then $0/a = 0$
 - 2. If $a \neq 0$, then $a/0$ is meaningless
 - 3. The symbol $0/0$ is indeterminate
- C. Defines a field as being an abstract mathematical system containing undefined terms, two operations, and eleven axioms
- D. Applies the concept of a field to problem solving
- E. Defines the terms congruence, modulus, and finite fields
- F. Writes and uses addition and multiplication tables for modulo arithmetic
- G. Identifies the additional properties needed for an ordered field
- H. Defines upper bound and least upper bound
- I. Identifies the additional property for a complete ordered field
- J. Demonstrates an understanding of the axiom of mathematical induction
- K. Proves or disproves statements by mathematical induction

CHECKLIST
ADVANCED MATHEMATICS CONTINUUM

_____ PUPIL

_____ TEACHER

II. Number Fields

- _____ A. Has a working knowledge of properties of the real number system
- _____ B. Recognizes and uses the properties of zero in division
- _____ C. Defines a field
- _____ D. Applies the concept of a field to problem solving
- _____ E. Defines congruence, modulus, and finite fields
- _____ F. Writes and uses addition and multiplication tables for modulo arithmetic
- _____ G. Identifies additional properties needed for an ordered field
- _____ H. Defines upper bound and least upper bound
- _____ I. Identifies additional property for a complete ordered field
- _____ J. Demonstrates an understanding of the axiom of mathematical induction
- _____ K. Proves or disproves statements by mathematical induction

CURRICULUM GUIDE FOR MATHEMATICS

ADVANCED MATHEMATICS CONTINUUM

III. Groups

- A. Defines a group as an abstract mathematical system containing undefined elements, one undefined operation, and four axioms
- B. Identifies the additional axiom needed for a commutative (Abelian) group
- C. Inspects examples of groups to identify inverses (a^{-1} , b^{-1} , etc.) and the identity element (e)
- D. Determines when a given set under a given operation does or does not form a group
- E. Proves theorems and statements involving group operations

CHECKLIST
ADVANCED MATHEMATICS CONTINUUM

PUPIL

TEACHER

III. Groups

- ___ A. Defines a group
- ___ B. Identifies an Abelian group
- ___ C. Identifies inverses and the identity element
- ___ D. Determines when a given set under a given operation does or does not form a group
- ___ E. Proves theorems and statements involving group operations

CURRICULUM GUIDE FOR MATHEMATICS

ADVANCED MATHEMATICS CONTINUUM

IV. Number Bases Other Than Ten

- A. Writes base ten numerals in polynomial form
- B. Indicates a knowledge of place value in other number bases
- C. Counts in other number bases
- D. Recognizes names used to denote other number bases such as binary and duodecimal and two new digit symbols used in duodecimal system
- E. Interchanges base ten numerals with numerals in other bases
- F. Adds, subtracts, multiplies, and divides in other number bases
- G. Concludes that the study of other number bases helps to better understand the base ten system

CHECKLIST

ADVANCED MATHEMATICS CONTINUUM

PUPIL

TEACHER

IV. Number Bases Other Than Ten

- A. Writes base ten numerals in polynomial form
- B. Indicates a knowledge of place value in other number bases
- C. Counts in other number bases
- D. Recognizes names used to denote other number bases
- E. Interchanges base ten numerals with numerals in other bases
- F. Adds, subtracts, multiplies, and divides in other number bases

CURRICULUM GUIDE FOR MATHEMATICS

ADVANCED MATHEMATICS CONTINUUM

V. Matrices and Determinants

A. Defines

- | | |
|-----------------------------|---------------------------|
| 1. Matrix | 6. Identity matrix |
| 2. Dimensions (of a matrix) | 7. Determinant |
| 3. Row matrix | 8. Order of a determinant |
| 4. Column matrix | 9. Minor of an element |
| 5. Zero matrix | 10. Scalar |

B. States dimensions of given matrices

C. Defines and writes the transpose of a given matrix, noting the symbol used

D. Performs matrix addition, scalar multiplication, and matrix multiplication

E. Finds the inverse of a given matrix if $d(A) \neq 0$

F. Solves systems of two equations by use of matrices

G. Evaluates determinants by using either the diagonal method or expansion by minors

H. Knows and applies properties of determinants

I. Solves systems of linear equations by using Cramer's Rule

J. Verifies roots of equations by substitution

CHECKLIST

ADVANCED MATHEMATICS CONTINUUM

PUPIL

TEACHER

V. Matrices and Determinants

- A. Defines terms associated with unit
- B. States dimensions of given matrices
- C. Defines and writes the transpose of a matrix
- D. Performs matrix addition, scalar multiplication, and matrix multiplication
- E. Finds inverse of a given matrix
- F. Solves systems of two equations by use of matrices
- G. Evaluates determinants
- H. Knows and applies properties of determinants
- I. Solves systems of linear equations by using Cramer's Rule
- J. Verifies roots of equations by substitution

CURRICULUM GUIDE FOR MATHEMATICS

ADVANCED MATHEMATICS CONTINUUM

VI. Permutations and Combinations

- A. Defines a permutation of n objects as being an arrangement of these objects in a particular order
- B. Recognizes and uses the special notation associated with permutations
- C. Defines n factorial ($n!$) and zero factorial ($0!$) and notes that factorials are defined only for non-negative integers
- D. Has a working knowledge of the Fundamental Principle of permutations
- E. Solves permutation problems of the following types:
 - 1. Linear permutations of n objects, all different
 - 2. Linear permutations of n objects, with some objects alike
 - 3. Linear permutations of n objects, taken r at the time ($r < n$)
 - 4. Circular permutations
- F. Defines a combination as being an arrangement of objects in which order is not considered
- G. Recognizes and uses special notation associated with combinations
- H. Knows and uses the formula for working simple combinations
- I. Extends the formula to solve combinations formed from several sets
- J. Uses summation concept to find total number of combinations
- K. Relates the concepts of permutations and combinations to real life situations

CHECKLIST

ADVANCED MATHEMATICS CONTINUUM

PUPIL

TEACHER

VI. Permutations and Combinations

- A. Defines a permutation
- B. Recognizes and uses the special notation associated with permutations
- C. Defines n factorial and zero factorial
- D. Has a working knowledge of the Fundamental Principle of permutations
- E. Solves permutation problems
- F. Defines a combination
- G. Recognizes and uses special notation associated with combinations
- H. Knows and uses the formula for working simple combinations
- I. Extends the formula to solve combinations formed from several sets
- J. Uses summation concept to find total number of combinations
- K. Relates the concepts of permutations and combinations to real life situations

CURRICULUM GUIDE FOR MATHEMATICS

ADVANCED MATHEMATICS CONTINUUM

VII. Probability

- A. Defines simple probability and works related problems
- B. Uses proper symbols in expressing probabilities
- C. Solves probability problems involving events which are
 - 1. Independent
 - 2. Dependent
 - 3. Mutually exclusive
 - 4. Nonmutually exclusive
- D. Determines the odds that an event will occur
- E. Points out the practical applications of probability to everyday situations

CHECKLIST
ADVANCED MATHEMATICS CONTINUUM

PUPIL

TEACHER

VII. Probability

- A. Defines simple probability and works related problems
- B. Recognizes and uses symbols to express probabilities
- C. Solves probability problems
- D. Determines odds that an event will occur

CURRICULUM GUIDE FOR MATHEMATICS

ADVANCED MATHEMATICS CONTINUUM

VIII. Differential Calculus

- A. Demonstrates an understanding of the concept of limits
- B. Has a working knowledge of symbols and abbreviations needed
- C. Finds indicated limits of expressions
- D. Examines functions for continuity at the point indicated
- E. Knows and uses the General Rule in differentiating functions
- F. Has a working knowledge of the formulas for differentiation
 - 1. Derivative of a constant is zero
 - 2. Derivative of a variable with respect to itself is unity
 - 3. Derivative of the algebraic sum of n functions is equal to the algebraic sum of their derivatives
 - 4. Derivative of the product of a constant and a function is equal to the product of the constant and the derivative of the function
 - 5. Derivative of the product of two functions is equal to the first function times the derivative of the second, plus the second function times the derivative of the first
 - 6. Derivative of the product of n functions is equal to the sum of the n products that can be formed by multiplying the derivative of each function by all the other functions
 - 7. Derivative of a function with a constant exponent is equal to the product of the exponent, the function with the exponent diminished by unity, and the derivative of the function
 - 8. Derivative of a fraction is equal to the denominator times the derivative of the numerator, minus the numerator times the derivative of the denominator, all divided by the square of the denominator
 - 9. Derivative of the quotient of a function by a constant is equal to the derivative of the function divided by the constant

- G. Recognizes various applications of the derivative
1. Finding slope
 2. Determining equation of a tangent and its normal
 3. Finding maximum and minimum values of a function
 4. Finding velocity
- H. Takes second derivative and finds acceleration

CHECKLIST
ADVANCED MATHEMATICS CONTINUUM

_____ PUPIL

_____ TEACHER

VIII. Differential Calculus

- _____ A. Demonstrates an understanding of the concept of limits
- _____ B. Has a working knowledge of symbols and abbreviations needed
- _____ C. Finds limits of expressions
- _____ D. Tests for continuity
- _____ E. Knows and uses the General Rule in differentiating functions
- _____ F. Has a working knowledge of the formulas for differentiation
- _____ G. Recognizes various applications of the derivative
- _____ H. Takes second derivative and finds acceleration

ENRICHMENT

- I. Polynomial Functions
- II. Boolean Algebra
- III. Integral Calculus

INTRODUCTION TO
VOCATIONAL—PREPARATORY MATHEMATICS

This section of the continuum has been written for those high school students who need a socially useful mathematics which will give them a preparation for competent and happy citizenship. The primary aim is to equip the student with a working knowledge of those basic principles of mathematics that he will need for personal and business use in his adult life.

To meet the needs of many types of students, the continuum contains a number of different mathematical experiences. Since work is more interesting if a person has a practical purpose or goal in sight, many problems that relate to occupations and careers are included. In addition, the continuum provides a review of the basic fundamentals of mathematics.

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level A and Level B

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level A

I. Counting and Computing with Whole Numbers

A. Demonstrates a knowledge of early number systems such as

1. Roman
2. Egyptian

B. Defines

1. Integer
2. Digit
3. Significant figures
4. Denominate numbers

C. Uses place value as an aid in reading and writing numerals

D. Rounds off numbers to the designated degree of accuracy

E. Rounds off to one significant figure to estimate answers

F. Performs operations using whole numbers

1. Addition
2. Subtraction
3. Multiplication
4. Division

G. Works with denominate numbers

1. Addition
2. Subtraction
3. Multiplication
4. Division

H. Checks answers by reversing order, using inverse operations, or casting out nines

CHECKLIST
GENERAL MATHEMATICS CONTINUUM
Level A

PUPIL

TEACHER

I. Counting and Computing with Whole Numbers

- A. Demonstrates a knowledge of early number systems
- B. Defines terms used
- C. Reads and writes numerals
- D. Rounds off numbers to given accuracy
- E. Rounds off to one significant figure to estimate answers
- F. Adds, subtracts, multiplies, and divides whole numbers
- G. Adds, subtracts, multiplies, and divides denominate numbers
- H. Checks answers by appropriate methods

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level A

II. Fractions

A. Defines

- | | |
|----------------------|------------------------------|
| 1. Numerator | 6. Reciprocal |
| 2. Denominator | 7. Lowest common denominator |
| 3. Unit fraction | 8. Prime number |
| 4. Proper fraction | 9. Mixed number |
| 5. Improper fraction | |

- B. Recognizes that the common fraction a/b means a divided by b
- C. Identifies proper fractions, improper fractions, and mixed numbers
- D. Expresses fractions in higher or lower terms
- E. Interchanges improper fractions and mixed numbers
- F. Finds lowest common denominator and changes fractions to equivalent fractions
- G. Compares two fractions to tell which is larger
- H. Arranges a series of fractions in order of size
- I. Adds fractions and mixed numbers
- J. Subtracts fractions and mixed numbers
- K. Multiplies fractions and mixed numbers
- L. Divides fractions and mixed numbers using the inverse property
- M. Simplifies all answers in any operation by reducing to lowest terms
- N. Rounds off fractional numbers
- O. Solves problems showing practical applications of fractions

CHECKLIST
GENERAL MATHEMATICS CONTINUUM

Level A

PUPIL

TEACHER

II. Fractions

- ___ A. Defines needed terms
- ___ B. Recognizes that a/b means a divided by b
- ___ C. Identifies proper fractions, improper fractions, and mixed numbers
- ___ D. Expresses fractions in higher or lower terms
- ___ E. Interchanges improper fractions and mixed numbers
- ___ F. Finds L.C.D. and changes fractions to equivalent fractions
- ___ G. Compares two fractions
- ___ H. Arranges a series of fractions in order of size
- ___ I. Adds fractions and mixed numbers
- ___ J. Subtracts fractions and mixed numbers
- ___ K. Multiplies fractions and mixed numbers
- ___ L. Divides fractions and mixed numbers
- ___ M. Simplifies all answers by reducing
- ___ N. Rounds off fractional numbers
- ___ O. Solves problems showing practical applications of fractions

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level A

III. Decimals

- A. Defines decimal fraction and mixed decimal
- B. Distinguishes between common fractions and decimal fractions
- C. Reads and writes decimals
- D. Interchanges decimals and common fractions
- E. Rounds off decimals to a given place
- F. Operates with decimals
 - 1. Adds
 - 2. Subtracts
 - 3. Multiplies
 - *4. Divides
- G. Compares decimals
- H. Uses shortcut method to multiply or divide whole numbers and decimals by 10, 100, 1000, etc.
- I. Finds averages
- J. Estimates answers to problems containing decimals
- K. Solves practical application problems involving decimals

* It is recommended that short division be taught and that long division of decimals be taught by the traditional method.

CHECKLIST
GENERAL MATHEMATICS CONTINUUM

Level A

PUPIL

TEACHER

III. Decimals

- ___ A. Defines decimal fraction and mixed decimal
- ___ B. Distinguishes between common fractions and decimal fractions
- ___ C. Reads and writes decimals
- ___ D. Interchanges decimals and common fractions
- ___ E. Rounds off decimals to a given place
- ___ F. Adds, subtracts, multiplies, and divides decimals
- ___ G. Compares decimals
- ___ H. Uses shortcut method to multiply or divide whole numbers and decimals by 10, 100, 1000, etc.
- ___ I. Finds averages
- ___ J. Estimates answers to problems containing decimals
- ___ K. Solves practical application problems involving decimals

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level A

IV. Ratio and Per Cent

- A. Defines ratio and recognizes the ways it may be expressed
- B. Writes ratios
- C. Forms equivalent ratios (proportion) having specified denominators
- D. Uses ratio and proportion to solve verbal problems
- E. Recognizes that per cent notation indicates that a number is being compared to 100
- F. Notes that a comparison of two numbers may be expressed as either a ratio, a fraction, a decimal, or a per cent
- G. Writes per cents (including per cents greater than 100% or less than 1%)
- H. Interchanges per cents with decimals
- I. Interchanges per cents with common fractions
- J. Uses Chart I and Chart II found at the end of this unit as an aid and time-saver in computation (It is recommended that each student have a copy of these charts.)
- K. Finds
 - 1. A per cent of a number
 - 2. What per cent one number is of another
 - 3. A number when a per cent of it is known
- L. Recognizes and uses the mnemonic device (is/of) as an aid in forming the ratio to solve per cent problems
- M. Solves problems involving per cents greater than 100 or less than 1

N. Applies the knowledge of per cent to everyday use in finding

1. Batting averages
2. Commission
3. Discount
4. Sales tax
5. Profit and loss
6. Simple interest

CHART I

TABLE OF EQUIVALENTS

PER CENTS, DECIMALS, AND COMMON FRACTIONS

PER CENT	DECIMAL	COMMON FRACTION
5%	.05	1/20
6 1/4%	.06 1/4	1/16
8 1/3%	.08 1/3	1/12
10%	.10 or .1	1/10
12 1/2%	.12 1/2 or .125	1/8
16 2/3%	.16 2/3	1/6
20%	.20 or .2	1/5
25%	.25	1/4
30%	.30 or .3	3/10
33%	.33 1/3	1/3
37 1/2%	.37 1/2 or .375	3/8
40%	.40 or .4	2/5
50%	.50 or .5	1/2
60%	.60 or .6	3/5
62 1/2%	.62 1/2 or .625	5/8
66 2/3%	.66 2/3	2/3
70%	.70 or .7	7/10
75%	.75	3/4
80%	.80 or .8	4/5
83 1/3%	.83 1/3	5/6
87 1/2%	.87 1/2 or .875	7/8
90%	.90 or .9	9/10
100%	1.00 or 1	

SHORTCUTS IN MULTIPLICATION AND DIVISION

CHART II

1. To multiply a number by

- (a) 50, multiply it by 100, then divide by 2
- (b) 25, multiply it by 100, then divide by 4
- (c) 20, multiply it by 100, then divide by 5
- (d) $33 \frac{1}{3}$, multiply it by 100, then divide by 3
- (e) $12 \frac{1}{2}$, multiply it by 100, then divide by 8
- (f) $16 \frac{2}{3}$, multiply it by 100, then divide by 6
- (g) $8 \frac{1}{3}$, multiply it by 100, then divide by 12
- (h) $6 \frac{1}{4}$, multiply it by 100, then divide by 16

2. To divide a number by

- (a) 50, multiply it by 2, then divide by 100
- (b) 25, multiply it by 4, then divide by 100
- (c) 20, multiply it by 5, then divide by 100
- (d) $33 \frac{1}{3}$, multiply it by 3, then divide by 100
- (e) $12 \frac{1}{2}$, multiply it by 8, then divide by 100
- (f) $16 \frac{2}{3}$, multiply it by 6, then divide by 100
- (g) $8 \frac{1}{3}$, multiply it by 12, then divide by 100
- (h) $6 \frac{1}{4}$, multiply it by 16, then divide by 100

CHECKLIST
GENERAL MATHEMATICS CONTINUUM

Level A

PUPIL

TEACHER

IV. Ratio and Per Cent

- ___ A. Defines ratio and recognizes the ways it may be expressed
- ___ B. Writes ratios
- ___ C. Forms equivalent ratios with specified denominators
- ___ D. Uses ratio and proportion in verbal problems
- ___ E. Notes that a comparison of two numbers may be expressed as either a ratio, a fraction, a decimal, or a per cent
- ___ F. Writes per cents
- ___ G. Interchanges per cents with decimals
- ___ H. Interchanges per cents with common fractions
- I. Finds
 - ___ 1. A per cent of a number
 - ___ 2. What per cent one number is of another
 - ___ 3. A number when a per cent of it is known
- ___ J. Forms ratios to solve per cent problems
- ___ K. Solves problems involving per cents greater than 100 or less than 1
- ___ L. Applies knowledge of per cent to everyday use in finding batting averages, commission, etc.

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level A

V. Measurement—English and Metric

- A. Identifies and uses basic tools of measurement
- B. Recognizes that all measurements are approximations
- C. Demonstrates a working knowledge of everyday units of measurements
- D. Converts within the English system, learning by rote the most common conversion factors and abbreviations
- E. Rounds off measures
- F. Defines the metric system and the basic units used
- G. Demonstrates a working knowledge of the prefixes used
 - 1. Milli-
 - 2. Centi-
 - 3. Deci-
 - 4. Deca-
 - 5. Hecto-
 - 6. Kilo-
- H. Uses standard abbreviations for metric units
- I. Distinguishes between and works with units of length and weight in the metric system
- J. Converts within the metric system such as
 - 1. Centimeters to meters
 - 2. Grams to kilograms
- K. Interchanges metric and English equivalents
- L. Demonstrates the use of the English and metric units in practical applications
- M. Defines, reads, and uses a protractor to measure the following:
 - 1. Angle
 - 2. Acute angle

3. Right angle
 4. Obtuse angle
 5. Straight angle
 6. Reflex angle
- N. Uses ruler to make and interpret scale drawings

CHECKLIST

GENERAL MATHEMATICS CONTINUUM

Level A

PUPIL

TEACHER

V. Measurement—English and Metric

- ___ A. Identifies and uses basic tools of measurement
- ___ B. Recognizes that all measurements are approximations
- ___ C. Demonstrates a working knowledge of everyday units of measurements
- ___ D. Converts within the English system
- ___ E. Rounds off measures
- ___ F. Defines the metric system and the basic units used
- ___ G. Demonstrates a working knowledge of the prefixes used
 - 1. Milli- 3. Deci- 5. Hecto-
 - 2. Centi- 4. Deca- 6. Kilo-
- ___ H. Uses standard abbreviations for metric units
- ___ I. Distinguishes between and works with units of length and weight in the metric system
- ___ J. Converts within the metric system
- ___ K. Interchanges metric and English equivalents
- ___ L. Demonstrates the use of the English and metric units in practical applications
- ___ M. Defines, reads, and measures various types of angles
- ___ N. Uses ruler to make and interpret scale drawings

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level B

VI. Graphs

- A. Defines and recognizes bar graphs, broken-line graphs, circle graphs, and pictographs
- B. Reads and interprets graphs, noting title, scales used, and the variations in design
- C. Makes graphs using the following steps:
 - 1. Choose type of graph
 - 2. Organize data (rounding off if necessary)
 - 3. Choose appropriate scales
 - 4. Draw graph
 - 5. Include title
- D. Discusses everyday uses of graphs

CHECKLIST
GENERAL MATHEMATICS CONTINUUM
Level B

PUPIL

TEACHER

VI. Graphs

- A. Defines and recognizes bar graphs, broken-line graphs, circle graphs, and pictographs
- B. Reads and interprets graphs
- C. Makes graphs

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level B

VII. Formulas

- A. Defines a formula
- B. Translates word statements into formulas
- C. Evaluates formulas
- D. Defines perimeter and circumference
- E. States formulas and finds perimeters of geometric figures such as
 - 1. Triangle
 - 2. Rectangle
 - 3. Parallelogram
 - 4. Trapezoid
- F. States the formula and finds the circumference of a circle
- G. Defines area and square unit
- H. States formulas and finds areas of geometric figures such as
 - 1. Rectangle
 - 2. Square
 - 3. Parallelogram
 - 4. Triangle
 - 5. Trapezoid
 - 6. Circle
- I. Defines volume and cubic unit
- J. Uses the proper formula and finds the volume of
 - 1. Rectangular solid
 - 2. Cylinder
 - 3. Pyramid
 - 4. Cone
 - 5. Sphere
- K. Associates use of formulas with practical applications

CHECKLIST
GENERAL MATHEMATICS CONTINUUM
Level B

PUPIL

TEACHER

VII. Formulas

- ___ A. Defines a formula
- ___ B. Translates word statements into formulas
- ___ C. Evaluates formulas
- ___ D. Defines perimeter and circumference
- ___ E. States formulas and finds perimeters of geometric figures
- ___ F. States the formula and finds circumference of a circle
- ___ G. Defines area and square unit
- ___ H. States formulas and finds areas of geometric figures
- ___ I. Defines volume and cubic unit
- ___ J. Uses the proper formula and finds volume of geometric figures

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level B

VIII. Computing Your Income

A. Defines

- | | |
|--------------------|-------------------------|
| 1. Overtime | 8. Rate of commission |
| 2. Time and a half | 9. Commission |
| 3. Take-home pay | 10. Social security tax |
| 4. Double time | 11. Withholding tax |
| 5. Hourly basis | 12. Taxable income |
| 6. Timecard | 13. Exemption |
| 7. Salary | 14. Deductions |

B. Computes income from hourly earnings

1. Determines overtime rate (if any)
2. Multiplies regular hourly rate by number of hours worked at regular rate of pay
3. Multiplies overtime hourly rate by number of hours of overtime worked
4. Adds the products found in steps (3) and (2)

C. Determines from a timecard the number of hours worked and then computes income

D. Computes income from piecework by multiplying the number of completed pieces of work by the amount paid per piece

E. Computes earnings paid on a commission basis

1. Expresses the rate of commission as a decimal fraction
2. Multiplies the number of dollars on which the commission is to be paid by the decimal fraction in step (1)

- F. Computes total salary by adding commission earned to the basic salary
- G. Computes social security tax to be deducted
 - 1. Expresses current social security tax rate as a decimal
 - 2. Multiplies the amount of money on which tax is to be paid by the decimal fraction of step (1)
- H. Computes social security tax to be paid by employer, employee, and self-employed persons
- I. Computes taxable income by subtracting the sum of the exemptions and deductions from the gross income
- J. Computes Federal income tax from tables
- K. Completes an actual income tax form, given a typical family situation
- L. Interprets statement of earnings attached to check for take-home pay

CHECKLIST
GENERAL MATHEMATICS CONTINUUM
Level B

PUPIL

TEACHER

VIII. Computing Your Income

- ___ A. Defines terms used
- ___ B. Computes income from hourly earnings, including overtime pay when applicable
- ___ C. Determines from a timecard the number of hours worked and then computes income
- ___ D. Computes income from piecework
- ___ E. Computes earnings paid on a commission basis
- ___ F. Computes total salary by adding commission and basic salary
- ___ G. Computes social security tax to be deducted
- ___ H. Computes social security tax to be paid by employer, employee, and self-employed persons
- ___ I. Computes taxable income
- ___ J. Computes Federal income tax from tables
- ___ K. Completes an actual income tax form
- ___ L. Interprets statement of earnings attached to check for take-home pay

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level B

IX. Managing Your Income

A. Defines

- | | |
|---------------------|-------------------------------|
| 1. Budget | 6. Drawer |
| 2. Checking account | 7. Service charge |
| 3. Deposit | 8. Cancelled checks |
| 4. Endorsement | 9. Bank statement |
| 5. Payee | 10. Federal Deposit Insurance |

B. Plans a budget to include

- | | |
|-----------------------------------|---------------------------|
| 1. Food | 5. Transportation |
| 2. Clothing | 6. Savings |
| 3. Housing and household expenses | 7. Miscellaneous expenses |
| 4. Health and recreation | |

C. Keeps an expense record for a given period of time, given a typical family income

D. Determines what per cent of the total income is spent on each item in a budget

E. Discusses factors to be considered in buying wisely

F. Works verbal problems applying rules for buying wisely

G. Writes checks and fills out check stubs correctly

H. Endorses checks properly

1. Blank endorsement
2. Full endorsement
3. Restricted endorsement

- I. Prepares bank deposits
- J. Examines bank statement noting various types of entries
- K. Discusses the need for keeping cancelled checks as receipts
- L. Reconciles the bank statement balance with the check stub balance

CHECKLIST

GENERAL MATHEMATICS CONTINUUM

Level B

PUPIL

TEACHER

IX. Managing Your Income

- A. Defines needed terms
- B. Plans a budget
- C. Keeps an expense record
- D. Determines what per cent of the total income is spent on each item in a budget
- E. Works verbal problems
- F. Writes checks and fills out check stubs correctly
- G. Endorses checks properly
- H. Prepares bank deposits
- I. Examines bank statement
- J. Reconciles the bank statement balance with the check stub balance

CURRICULUM GUIDE FOR MATHEMATICS

GENERAL MATHEMATICS CONTINUUM

Level B

X. Using Your Income

A. Defines

- | | |
|--------------------|-----------------------|
| 1. Discount | 6. Installment buying |
| 2. Discount rate | 7. Down payment |
| 3. Simple interest | 8. Carrying charge |
| 4. Interest rate | 9. Savings account |
| 5. Principal | 10. Compound interest |

B. Finds discount and sale price, given the discount rate and the regular price

C. Finds discount rate

D. Knows and applies formula for simple interest

E. Demonstrates an understanding of the concept of installment buying, including down payment, carrying charge, and installments

F. Computes carrying charge and interest rate on installment purchases

G. Points out the advantage of cash buying rather than installment buying

H. Distinguishes between a checking account and a savings account

I. Computes compound interest

CHECKLIST
GENERAL MATHEMATICS CONTINUUM
Level B

PUPIL

TEACHER

X. Using Your Income

- A. Defines needed terms
- B. Finds discount and sale price
- C. Finds discount rate
- D. Knows and applies simple interest formula
- E. Demonstrates an understanding of the concept of installment buying
- F. Computes carrying charge and interest rate on installment purchases
- G. Distinguishes between a checking account and a savings account
- H. Computes compound interest

ENRICHMENT

- I. Other Number Bases (See page 126 in the guide)
- II. Introduction to Algebra (page 188)
- III. Geometric Constructions (page 183)
- IV. Number Puzzles
- V. Insurance, Stocks, and Bonds (pages 180 and 197)

CURRICULUM GUIDE FOR MATHEMATICS

SENIOR MATHEMATICS CONTINUUM

Level A and Level B

CURRIUCLUM GUIDE FOR MATHEMATICS

SENIOR MATHEMATICS CONTINUUM

Level A

I. Numbers and Their Operations

- A. Demonstrates an understanding of the concept of place value
- B. Reads and writes Roman numerals
- C. Reads, writes, and rounds off numerals in the decimal (base 10) system
- D. Reads and writes numerals in non-decimal systems (other number bases)
- E. Recognizes and applies the properties of the number system to operations with numbers
- F. Adds, subtracts, multiplies, and divides whole numbers
- G. Reduces, adds, subtracts, multiplies, and divides common fractions
- H. Adds, subtracts, multiplies, and divides decimal fractions
- I. Compares two whole numbers, two fractions, or two decimals to determine which is larger
- J. Arranges a series of numbers in order of size
- K. Defines
 - 1. Factor
 - 2. Prime number
 - 3. Composite number
 - 4. Greatest common factor (G.C.F.)
 - 5. Least common multiple (L.C.M.)
- L. Factors whole numbers into primes
- M. Determines G.C.F. and L.C.M., given a set of numbers
- N. Defines and works with per cent
- O. Relates common fraction—decimal fraction—per cent equivalents (See page 149 in guide.)

- P. Defines irrational numbers as non-terminating and non-repeating decimals
- Q. Extracts square roots by
 - 1. Use of tables
 - 2. Approximation
 - 3. Traditional method
- R. Checks answers using appropriate methods such as reversing order, using inverse operations, and casting out nines
- S. Solves practical application problems

CHECKLIST
SENIOR MATHEMATICS CONTINUUM
Level A

_____ PUPIL

_____ TEACHER

I. Numbers and Their Operations

- _____ A. Demonstrates an understanding of the concept of place value
- _____ B. Reads and writes Roman numerals
- _____ C. Reads, writes, and rounds off numerals in decimal system
- _____ D. Reads and writes numerals in other number bases
- _____ E. Recognizes and applies properties of the number system
- _____ F. Operates with whole numbers
- _____ G. Operates with common fractions
- _____ H. Operates with decimal fractions
- _____ I. Compares two numbers to determine which is larger
- _____ J. Arranges a series of numbers in order of size
- _____ K. Defines terms associated with factoring
- _____ L. Factors whole numbers into primes
- _____ M. Determines G.C.F. and L.C.M., given a set of numbers
- _____ N. Defines and works with per cent
- _____ O. Relates common fraction-decimal-per cent equivalents
- _____ P. Defines irrational numbers
- _____ Q. Extracts square roots
- _____ R. Checks answers using appropriate methods

CURRICULUM GUIDE FOR MATHEMATICS

SENIOR MATHEMATICS CONTINUUM

Level A

II. Measurement

A. Defines

- | | |
|------------------|-----------------------|
| 1. Precision | 4. Significant digits |
| 2. Maximum error | 5. Denominate numbers |
| 3. Tolerance | |

B. Recognizes that numbers used for counting are exact and that all measurements are approximate

C. Determines unit of measure used and states precision of a measurement

D. Determines unit of measure and states the maximum error

E. Tells the number of significant digits

F. Applies the concepts of precision and accuracy to practical situations

G. Expresses measurements in like units before performing fundamental operations

H. Performs operations with denominate numbers, converting all answers to simplest form

I. Defines the metric system and the basic units used

J. Demonstrates a working knowledge of the prefixes used

- | | | |
|-----------|----------|-----------|
| 1. Milli- | 3. Deci- | 5. Hecto- |
| 2. Centi- | 4. Deca- | 6. Kilo- |

K. Uses standard abbreviations for metric units

L. Distinguishes among and works with units of length, weight, and volume in the metric system

- M. Converts within the metric system such as
 - 1. Centimeters to meters
 - 2. Grams to kilograms
 - 3. Milliliters to liters
- N. Interchanges metric and English equivalents
- O. Demonstrates the use of the English and metric units in practical applications, such as
 - 1. Olympic results
 - 2. Scale drawings
 - 3. Construction and design

CHECKLIST
SENIOR MATHEMATICS CONTINUUM

Level A

PUPIL

TEACHER

II. Measurement

- A. Defines needed terms
- B. Recognizes that numbers used for counting are exact and that all measurements are approximate
- C. Determines unit of measure used and states precision of a measurement
- D. Determines unit of measure and states the maximum error
- E. Tells the number of significant digits
- F. Performs operations with denominate numbers
- G. Defines the metric system and the basic units used
- H. Demonstrates a working knowledge of the prefixes used in the metric system
- I. Uses standard abbreviations for metric units
- J. Distinguishes among and works with units of length, weight, and volume in the metric system
- K. Converts within the metric system
- L. Interchanges metric and English equivalents

CURRICULUM GUIDE FOR MATHEMATICS

SENIOR MATHEMATICS CONTINUUM

Level A

III. Graphs and Statistics

- A. Defines and recognizes bar graphs, broken-line graphs, circle graphs, and pictographs
- B. Reads and interprets graphs, noting title, scales used, and the variations in design
- C. Makes graphs
- D. Uses graphs to show relationships in statistical data
- E. Defines
 - 1. Statistics
 - 2. Central tendency
 - 3. Mean (arithmetic average)
 - 4. Frequency
 - 5. Frequency table
 - 6. Median
 - 7. Mode
- F. Estimates and computes the mean (arithmetic average)
- G. Prepares frequency table from given data and finds mean, median, and mode
 - 1. By listing data singly
 - 2. By grouping data in intervals
- H. Applies statistical measures to data obtained from real life situations

CHECKLIST
SENIOR MATHEMATICS CONTINUUM
Level A

PUPIL

TEACHER

III. Graphs and Statistics

- A. Defines and recognizes bar graphs, broken-line graphs, circle graphs, and pictographs
- B. Reads and interprets graphs
- C. Makes graphs
- D. Defines terms related to statistics
- E. Estimates and computes the mean
- F. Prepares frequency table and finds mean, median, and mode

CURRICULUM GUIDE FOR MATHEMATICS

SENIOR MATHEMATICS CONTINUUM

Level A

IV. Consumer Income

A. Defines

- | | |
|------------------------|--------------------|
| 1. Income | 8. Double time |
| 2. Withholding tax | 9. Hourly wage |
| 3. Social security tax | 10. Timecard |
| 4. Take-home pay | 11. Commission |
| 5. Income tax | 12. Taxable income |
| 6. Overtime | 13. Exemption |
| 7. Time and a half | 14. Deductions |

- B. Determines from a time card the number of hours worked
- C. Figures income on hourly basis, using overtime when applicable
- D. Computes income from piecework
- E. Computes earnings on a commission basis
- F. Finds the amount to be deducted for social security tax, using current tax rate
- G. Completes an employee's withholding exemption certificate
- H. Finds amount of withholding tax
- I. Calculates take-home pay for a given pay period
- J. Completes an actual income tax return, given a typical family situation
1. Interprets a W-2 form
 2. Figures deductions and exemptions
 3. Computes taxable income

4. Finds tax from tables
 5. Compares results of steps (1) and (4) to determine either refund or tax due
- K. Knows and uses the formula for simple interest
 - L. Computes simple interest using the 6%—60 day method as a shortcut
 - M. Distinguishes between simple and compound interest
 - N. Notes that a savings account produces income
 - O. Finds interest earned on savings accounts
 - P. Solves problems involving compound interest using computation, formula, or tables
 - Q. Defines stocks and bonds
 - R. Solves problems involving stocks and bonds
 - S. Figures monthly social security benefit payments using current benefit schedule

CHECKLIST
SENIOR MATHEMATICS CONTINUUM
Level A

PUPIL

TEACHER

IV. Consumer Income

- ___ A. Defines needed terms
- ___ B. Figures income on hourly basis
- ___ C. Computes income from piecework
- ___ D. Computes earnings on a commission basis
- ___ E. Finds amount of social security tax to be deducted
- ___ F. Completes an employee's withholding certificate
- ___ G. Finds amount of withholding tax
- ___ H. Calculates take-home pay
- ___ I. Completes an actual income tax return
- ___ J. Knows and uses the formula for simple interest
- ___ K. Computes simple interest using $6\frac{1}{2}$ —60 day method
- ___ L. Finds interest earned on savings accounts
- ___ M. Solves problems involving compound interest
- ___ N. Solves problems involving stocks and bonds
- ___ O. Figures monthly social security benefit payments

CURRICULUM GUIDE FOR MATHEMATICS

SENIOR MATHEMATICS CONTINUUM

Level B

V. Consumer Expenditures

A. Defines

- | | |
|-----------------------|---------------------|
| 1. Checking account | 7. Discount rate |
| 2. Budget | 8. Promissory notes |
| 3. Installment buying | 9. Bank discounts |
| 4. Carrying charge | 10. Beneficiary |
| 5. Invoice | 11. Policy |
| 6. Discount | 12. Premium |

B. Completes forms necessary for opening checking accounts

C. Writes checks and fills out check stubs correctly

D. Endorses checks properly

E. Examines bank statement and reconciles the bank statement balance with the check stub balance

F. Discusses the need for keeping canceled checks as receipts

G. Plans a budget to include

- | | |
|-----------------------------------|---------------------------|
| 1. Food | 5. Transportation |
| 2. Clothing | 6. Savings |
| 3. Housing and household expenses | 7. Insurance |
| 4. Health and recreation | 8. Miscellaneous expenses |

H. Keeps an expense record for a given period of time, given a typical family income

I. Determines what per cent of the total income is spent on each item in a budget

J. Discusses wise buying and applies it to verbal problems

- K. Compares and contrasts the advantages and disadvantages of installment buying
- L. Computes carrying charge and interest rate on installment purchases
- M. Finds true rate of interest on installment buying by using
 - 1. Table of payments
 - 2. Average principal
- N. Solves problems related to life insurance using tables for
 - 1. Mortality
 - 2. Term
 - 3. Straight life
 - 4. Limited payment
 - 5. Endowment
- O. Demonstrates a working knowledge of
 - 1. Discount
 - 2. Discount rate
 - 3. List price
 - 4. Sale (net) price
 - 5. Successive discounts
 - 6. Single equivalent discount
- P. Knows and applies concepts relating to promissory notes and bank discounts

CHECKLIST
SENIOR MATHEMATICS CONTINUUM
Level B

PUPIL

TEACHER

V. Consumer Expenditures

- A. Defines terms used in this unit
- B. Completes forms needed to open a checking account
- C. Writes checks, fills out stubs, and endorses checks
- D. Reconciles bank statement balance with the check stub balance
- E. Plans a budget
- F. Keeps an expense record for a given period of time
- G. Determines what per cent of total income is spent on each item in a budget
- H. Computes carrying charge and interest rate on installment purchases
- I. Finds true rate of interest on installment purchases
- J. Solves problems related to life insurance
- K. Demonstrates a working knowledge of terms related to sales discounts and bank discounts
- L. Works problems involving promissory notes and bank discounts

CURRICULUM GUIDE FOR MATHEMATICS

SENIOR MATHEMATICS CONTINUUM

Level B

VI. Basic Ideas of Geometry

A. Defines

- | | |
|------------------------|----------------------|
| 1. Angle | 6. Congruence |
| 2. Protractor | 7. Ratio |
| 3. Perpendicular lines | 8. Similar triangles |
| 4. Parallel lines | 9. Polygon |
| 5. Transversal | |

B. Notes undefined geometric terms

1. Point
2. Line

C. Identifies the parts of an angle and reads an angle

D. Classifies angles by measure or relationship

- | | |
|-------------|------------------------|
| 1. Acute | 5. Alternate-interior |
| 2. Right | 6. Corresponding |
| 3. Obtuse | 7. Vertical (opposite) |
| 4. Straight | |

E. Uses protractor to measure and to draw angles

F. Distinguishes between and works with complementary and supplementary angles

G. Uses compass and unmarked straight edge to construct

1. An angle equal to a given angle
2. A line parallel to a given line

3. A segment equal to a given segment
 4. A given number of equal segments on a line
- H. Classifies triangles according to angles and sides
 - I. Identifies and names corresponding parts of similar and congruent polygons
 - J. Knows and applies three methods of proving triangles congruent
 1. SAS
 2. SSS
 3. ASA
 - K. Writes ratios from given information
 - L. Writes equal ratios (proportions) identifying means and extremes
 - M. Solves problems involving ratio
 - N. Knows and applies the concept of similarity to triangles
 - O. Distinguishes between inductive and deductive reasoning
 - P. Writes simple proofs (optional)

CHECKLIST
SENIOR MATHEMATICS CONTINUUM

Level B

PUPIL

TEACHER

VI. Basic Ideas of Geometry

- A. Defines needed terms
- B. Notes undefined geometric terms
- C. Identifies the parts of an angle and reads an angle
- D. Classifies angles by measure or relationship
- E. Uses protractor to measure and to draw angles
- F. Distinguishes between and works with complementary and supplementary angles
- G. Uses compass and unmarked straight edge to construct geometric figures
- H. Classifies triangles according to angles and sides
- I. Identifies and names corresponding parts of similar and congruent polygons
- J. Knows and applies three methods of proving triangles congruent
- K. Writes ratios from given information
- L. Writes proportions identifying means and extremes
- M. Solves problems involving ratio
- N. Knows and applies the concept of similarity to triangles
- O. Distinguishes between inductive and deductive reasoning

CURRICULUM GUIDE FOR MATHEMATICS

SENIOR MATHEMATICS CONTINUUM

Level B

VII. Formulas, Areas, and Volumes

- A. Defines a formula
- B. Translates word statements into formulas
- C. Evaluates formulas
- D. Solves simple verbal problems using formulas
- E. Defines polygon, perimeter, and circumference
- F. Writes formulas and finds perimeters of triangles, squares, and other polygons
- G. Writes formula and finds circumference of circle
- H. Defines
 - 1. Area
 - 2. Square unit (surface unit)
 - 3. Exponent
 - 4. Altitude (height)
- I. Writes formulas and finds areas of
 - 1. Rectangle
 - 2. Square
 - 3. Parallelogram
 - 4. Triangle
 - 5. Trapezoid
 - 6. Circle
- J. Applies basic area formulas to more complex polygons
- K. Defines volume and cubic unit
- L. Uses the proper formula and finds the volume of
 - 1. Rectangular solid
 - 2. Cube
 - 3. Cone
 - 4. Cylinder
 - 5. Pyramid
 - 6. Sphere
- M. Associates use of formulas with practical applications

CHECKLIST
SENIOR MATHEMATICS CONTINUUM

Level B

PUPIL

TEACHER

VII. Formulas, Areas, and Volumes

- A. Defines formula
- B. Translates word statements into formulas
- C. Evaluates formulas
- D. Solves verbal problems using formulas
- E. Defines polygon, perimeter, and circumference
- F. Writes formulas and finds perimeters of different polygons
- G. Writes formula and finds circumference of circle
- H. Defines terms related to area
- I. Writes formulas and finds areas
- J. Defines volume and cubic unit
- K. Uses formulas and finds volumes

CURRICULUM GUIDE FOR MATHEMATICS

SENIOR MATHEMATICS CONTINUUM

Level B

VIII. Basic Ideas of Algebra

A. Defines

- | | |
|---------------|-------------------|
| 1. Variable | 5. Like terms |
| 2. Expression | 6. Absolute value |
| 3. Equation | 7. Monomial |
| 4. Inequality | 8. Polynomial |

B. Translates word expressions into algebraic expressions using appropriate symbols

C. Interprets algebraic expressions

D. Uses the rule for order of operations to evaluate numerical expressions

E. Evaluates algebraic expressions

F. Demonstrates an understanding of the properties of the real number system

G. Solves simple equations and inequalities and checks the solution (root)

H. Translates simple word statements into algebraic statements and solves

I. Simplifies expressions by combining like terms

J. Solves equations requiring more than one operation

K. Defines real number line, positive numbers, and negative numbers

L. Uses the real number line as an aid in adding or subtracting directed numbers

M. Uses the concept of absolute value to derive rules for adding and subtracting directed numbers

- N. Adds and subtracts directed numbers by using rules
- O. Knows and applies rules for multiplication and division of directed numbers (noting that zero can not be used as a divisor)
- P. Simplifies expressions and solves equations containing symbols of inclusion
- Q. Defines
- | | |
|----------------------------------|---------------------|
| 1. Graph | 6. Ordinate |
| 2. Horizontal axis | 7. Abscissa |
| 3. Vertical axis | 8. Origin |
| 4. Coordinates (ordered pairs) | 9. Quadrant |
| 5. Rectangular coordinate system | 10. Linear equation |
- R. Graphs formulas in first quadrant
- S. Plots points and graphs linear equations in the coordinate plane
- T. Defines right triangle, hypotenuse, and legs
- U. Knows and applies the Pythagorean Theorem
- V. Defines an irrational number, a perfect square, and principal square root
- W. Extracts square root by using
1. Table
 2. Approximation
 3. Traditional method

CHECKLIST
SENIOR MATHEMATICS CONTINUUM
Level B

PUPIL

TEACHER

VIII. Basic Ideas of Algebra

- A. Defines needed terms
- B. Translates word expressions into algebraic expressions
- C. Interprets algebraic expressions
- D. Evaluates numerical expressions
- E. Evaluates algebraic expressions
- F. Demonstrates an understanding of the properties of the real number system
- G. Solves and checks simple equations and inequalities
- H. Translates simple word statements into algebraic statements and solves
- I. Simplifies expressions by combining like terms
- J. Solves equations requiring more than one operation
- K. Defines real number line, positive numbers, and negative numbers
- L. Adds and subtracts directed numbers using the real number line
- M. Uses the concept of absolute value
- N. Adds and subtracts directed numbers using rules
- O. Knows and applies rules for multiplication and division of directed numbers
- P. Simplifies expressions and solves equations containing symbols of inclusion
- Q. Defines terms needed in graphing

- ___ R. Graphs formulas in first quadrant
- ___ S. Plots points and graphs linear equations in the coordinate plane
- ___ T. Defines right triangle, hypotenuse, and legs
- ___ U. Knows and applies the Pythagorean Theorem
- ___ V. Defines an irrational number, a perfect square, and principal square root
- ___ W. Extracts square roots

ENRICHMENT

- I. Logarithms (see page 53 in the guide)
- II. Logic (page 119)
- III. Probability, Permutations, and Combinations (pages 130,132)

CURRICULUM GUIDE FOR MATHEMATICS

BUSINESS MATHEMATICS CONTINUUM

Level A and Level B

CURRICULUM GUIDE FOR MATHEMATICS

BUSINESS MATHEMATICS CONTINUUM

Level A

I. Fundamentals of Business Arithmetic

- A. Demonstrates a detailed knowledge of all terms and definitions pertaining to fundamental operations
- B. Reads, writes, and compares
 - 1. Whole numbers
 - 2. Decimals
 - 3. Fractions
- C. Adds, subtracts, multiplies, and divides
 - 1. Whole numbers
 - 2. Decimals
 - 3. Fractions
 - 4. Denominate numbers
- D. Solves verbal business problems applying fundamental operations
- E. Extends the understanding of fractions to include ratio and proportion
- F. Interchanges common fraction—decimal—per cent equivalents (refer to chart on p. 149 in the guide)
- G. Solves percentage problems using the formula $p = br$
- H. Solves problems involving per cents less than 1 and greater than 100
- I. Works business problems involving per cents
- J. Reads, interprets, and draws
 - 1. Bar graphs
 - 2. Broken-line graphs
 - 3. Circle graphs

CHECKLIST
BUSINESS MATHEMATICS CONTINUUM
Level A

PUPIL

TEACHER

I. Fundamentals of Business Arithmetic

- ____ A. Demonstrates a detailed knowledge of all terms and definitions pertaining to fundamental operations
- ____ B. Reads, writes, and compares
 - ____ 1. Whole numbers
 - ____ 2. Fractions
 - ____ 3. Decimals
- ____ C. Adds, subtracts, multiplies, and divides
 - ____ 1. Whole numbers
 - ____ 2. Fractions
 - ____ 3. Decimals
 - ____ 4. Denominate numbers
- ____ D. Solves verbal business problems using the fundamental operations
- ____ E. Works with ratio and proportion
- ____ F. Interchanges common fraction-decimal-per cent equivalents
- ____ G. Solves percentage problems using the formula $p = br$
- ____ H. Solves problems involving per cents less than 1 and greater than 100
- ____ I. Works business problems involving per cents
- ____ J. Reads, interprets, and draws
 - ____ 1. Bar graphs

- _____ 2. Broken-line graphs
- _____ 3. Circle graphs

CURRICULUM GUIDE FOR MATHEMATICS

BUSINESS MATHEMATICS CONTINUUM

Level A

II. Family Income and Community Activities

- A. Defines terms associated with budgets, utilities, taxes, insurance, and personal banking
- B. Plans a budget and keeps an expense record, given a typical family situation
- C. Applies the principles of wise buying to the solution of verbal problems
- D. Demonstrates a working knowledge of personal banking
 - 1. Fills out deposit slips
 - 2. Writes checks and fills in check stubs
 - 3. Interprets bank statements and service charges
 - 4. Reconciles bank statements
- E. Reads meters and computes the cost of utilities
- F. Discusses the need for and distinguishes between various types of automobile insurance
 - 1. Public liability
 - 2. Property damage
 - 3. Comprehensive
 - 4. Collision
- G. Lists and works with factors related to fire insurance
 - 1. Type of construction
 - 2. Geographic location
 - 3. Type of policy (regular, homeowner's)

- H. Outlines in order of premium cost from lowest to highest, types of life insurance
 - 1. Term
 - 2. Ordinary life
 - 3. Limited payment
 - 4. Endowment
- I. Demonstrates an understanding of factors related to life insurance
 - 1. Mortality tables
 - 2. Computation of premiums and methods of payment
 - 3. Financial protection (or savings)
 - 4. Privileges (cash value, borrowing)
- J. Answers questions about insurance benefits paid by social security
 - 1. Income and age limitations
 - 2. Retirement
 - 3. Survivor's
 - 4. Disability
- K. Solves verbal problems involving insurance
- L. Demonstrates a working knowledge of direct and indirect taxes
 - 1. Sales
 - 2. Internal revenue (excise, estate, income)
 - 3. Property

CHECKLIST
BUSINESS MATHEMATICS CONTINUUM

Level A

_____ PUPIL

_____ TEACHER

II. Family Income and Community Activities

- _____ A. Defines terms associated with budgets, utilities, taxes, insurance, and personal banking
- _____ B. Plans a budget and keeps an expense record
- _____ C. Solves verbal problems related to use of family income
- _____ D. Demonstrates a working knowledge of personal banking
 - _____ 1. Fills out deposit slips
 - _____ 2. Writes checks and fills out check stubs
 - _____ 3. Interprets bank statements and service charges
 - _____ 4. Reconciles bank statements
- _____ E. Reads meters and computes the cost of utilities
- _____ F. Distinguishes between types of automobile insurance
- _____ G. Lists and works with factors related to fire insurance
- _____ H. Distinguishes between types of life insurance
- _____ I. Computes life insurance premiums
- _____ J. Answers questions about social security benefits
- _____ K. Solves verbal problems involving insurance
- _____ L. Demonstrates a working knowledge of direct and indirect taxes
 - _____ 1. Sales
 - _____ 2. Internal Revenue (excise, estate, income)
 - _____ 3. Property

CURRICULUM GUIDE FOR MATHEMATICS

BUSINESS MATHEMATICS CONTINUUM

Level A

III. Preparation of Payrolls

A. Computes income based on

1. Hourly (or daily) rate
2. Salaried earnings
3. Piecework wage system
4. Overtime pay rate
5. Rate of commission

B. Fills out

1. Application for social security number
2. Withholding exemption forms

C. Names common payroll deductions such as

1. Federal income tax (withholding)
2. Social security tax (F.I.C.A.)
3. State income tax
4. Retirement
5. Union dues
6. Insurance premiums
7. Payroll savings

D. Computes individual total wages, deductions, and net (take-home) pay

E. Completes a company payroll for a given pay period

F. Prepares a currency memorandum to meet a payroll

G. Completes actual end-of-the year forms for federal and state income tax, given a typical family situation

CHECKLIST

BUSINESS MATHEMATICS CONTINUUM

Level A

PUPIL

TEACHER

III. Preparation of Payroll

A. Computes income based on

- ____ 1. Hourly (or daily) rate
- ____ 2. Salaried earnings
- ____ 3. Piecework wage system
- ____ 4. Overtime pay rate
- ____ 5. Rate of commission

B. Fills out

- ____ 1. Application for social security number
- ____ 2. Withholding exemption forms

C. Names common payroll deductions such as

- ____ 1. Federal income tax
- ____ 2. Social security tax
- ____ 3. State income tax
- ____ 4. Retirement
- ____ 5. Union dues
- ____ 6. Insurance premiums
- ____ 7. Payroll savings

____ D. Computes individual total wages, deductions, and take-home pay

____ E. Completes a company payroll

____ F. Prepares a currency memorandum

____ G. Completes federal and state income tax forms

CURRICULUM GUIDE FOR MATHEMATICS

BUSINESS MATHEMATICS CONTINUUM

Level B

IV. Problems in Retail Selling

A. Defines

- | | |
|-------------------------------|-------------------------|
| 1. Discounts (trade and cash) | 5. Successive discounts |
| 2. Discount rate | 6. Equivalent discount |
| 3. List price | 7. Invoice |
| 4. Net price | |

B. Finds discount and net price, given the list price and rate of discount

C. Finds net price, given a series of discounts and the list price

D. Finds a single discount rate equivalent to a series of discount rates

E. Finds discount rate or list price when other information is given

F. Solves verbal problems related to discounts

G. Reads and interprets invoices computing discount and net amount to be paid

H. Defines

- | | |
|--------------------|-----------------|
| 1. Margin (markup) | 4. Profit |
| 2. Selling price | 5. Loss |
| 3. Overhead | 6. Gross profit |

I. Computes margin and per cent of margin based on

1. Cost
2. Selling price

- J. Computes the selling price when per cent of margin is based on
1. Cost
 2. Selling price
- K. Computes cost when per cent of margin is based on selling price
- L. Works problems based on the selling price formula $S = C + O + P$
- M. Codes cost on a simulated price tag (optional)
- N. Applies concepts of retail selling to the solution of verbal problems

CHECKLIST
BUSINESS MATHEMATICS CONTINUUM

Level B

_____ PUPIL

_____ TEACHER

IV. Problems in Retail Selling

- _____ A. Defines terms related to discount
- _____ B. Finds discount and net price, given the list price and rate of discount
- _____ C. Finds net price, given a series of discounts and the list price
- _____ D. Finds a single discount rate equivalent to a series of discount rates
- _____ E. Finds discount rate or list price when other information is given
- _____ F. Solves verbal problems related to discounts
- _____ G. Reads and interprets invoices, computing discount and net amount to be paid
- _____ H. Defines terms related to profit and loss
- _____ I. Computes margin and per cent of margin based on
 - _____ 1. Cost
 - _____ 2. Selling price
- _____ J. Computes the selling price when per cent of margin is based on
 - _____ 1. Cost
 - _____ 2. Selling price
- _____ K. Computes cost when per cent of margin is based on selling price
- _____ L. Works problems based on the formula $S = C + O + P$
- _____ M. Solves verbal problems

CURRICULUM GUIDE FOR MATHEMATICS

BUSINESS MATHEMATICS CONTINUUM

Level B

- V. Interest, Bank Discount, and Installment Buying
- A. Uses the formula $i = prt$ to solve simple interest problems (noting 6%—60 day method)
 - B. Finds time lapse between two dates and computes exact interest
 - C. Defines promissory note and related terms
 - D. Works with promissory notes to find
 - 1. Interest (bank discount)
 - 2. Net proceeds
 - 3. Amount due at maturity
 - E. Distinguishes between simple interest and compound interest
 - F. Computes amount and/or compound interest at end of a given period by
 - 1. Traditional method
 - 2. Use of tables
 - G. Distinguishes between a checking account and a savings account
 - H. Computes interest and total amount of a savings account for a given period of time
 - I. Defines installment buying, carrying charge, and down payment
 - J. Lists advantages and disadvantages of installment buying
 - K. Determines carrying charge, given cash price and installment price
 - L. Computes installment price by adding the down payment to the product of the number of payments and the amount of each payment
 - M. Computes true rate of interest on installment purchases

CHECKLIST
BUSINESS MATHEMATICS CONTINUUM
Level B

PUPIL

TEACHER

V. Interest, Bank Discount, and Installment Buying

- ___ A. Uses the formula $i = prt$ to solve problems
- ___ B. Uses 6%—60 day method
- ___ C. Defines promissory note and related terms
- ___ D. Works with promissory notes to find
 - ___ 1. Interest
 - ___ 2. Net proceeds
 - ___ 3. Amount due at maturity
- ___ E. Computes amount and compound interest at end of a period
- ___ F. Computes interest and total amount of a savings account
- ___ G. Defines installment buying, carrying charge, and down payment
- ___ H. Lists advantages and disadvantages of installment buying
- ___ I. Determines carrying charge
- ___ J. Computes installment price
- ___ K. Computes true rate of interest on installment purchases

CURRICULUM GUIDE FOR MATHEMATICS

BUSINESS MATHEMATICS CONTINUUM

Level B

VI. Business Problems in Local Industries

A. Defines

- | | |
|---------------------------------|-------------------------|
| 1. Savings and loan association | 5. Series E bonds |
| 2. Mortgage | 6. Board feet |
| 3. Depreciation | 7. Co-operative |
| 4. Dividend | 8. Maturity (of a bond) |

B. Lists functions of banks and savings and loan associations

C. Solves verbal problems involving loans for personal or business use

D. Demonstrates an understanding of U. S. Savings Bonds

1. As a means of savings
2. Bought through Payroll Savings Plan
3. Determines maturity value and maturity date from table

E. Defines credit union and discusses the functions of credit unions

F. Calculates depreciation by

1. Straight-line method
2. Declining-balance method
3. Sum-of-the-years'-digits method (optional)

G. Lists local industries and investigates business-related problems

H. Finds the number of board feet in a quantity of lumber using the formula

No. of Bd. ft. = length in ft. x width in ft. x thickness in inches

I. Solves verbal problems relating to

1. Farming
2. Stock-raising
3. Co-operative marketing
4. Poultry and dairy industries
5. Truck gardening and fruit industries
6. Fishing
7. Transportation costs
8. Wood products
9. Construction industry

CHECKLIST
BUSINESS MATHEMATICS CONTINUUM
Level B

_____ PUPIL

_____ TEACHER

VI. Business Problems in Local Industries

- _____ A. Defines needed terms
- _____ B. Lists functions of banks and savings and loan associations
- _____ C. Solves verbal problems involving loans for personal or business use
- _____ D. Demonstrates an understanding of U. S. Savings Bonds
- _____ E. Defines credit union and discusses their functions
- _____ F. Calculates depreciation
- _____ G. Finds the number of board feet in a quantity of lumber
- _____ H. Solves verbal problems concerning local industries

ENRICHMENT

- I. Civil Service and Employment
- II. Annuities, Stocks, and Bonds
- III. Measurements and Bar Graphs (see pages 172 and 175 in guide)
- IV. Business Records
 - A. Balance Sheet
 - B. Income Statement
 - C. Profit and Loss Statement
 - D. Inventory