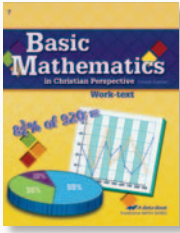


Basic Mathematics Grade 7



Basic Mathematics is the capstone of arithmetic studies. Students must solidify their skills in arithmetic and be confident, competent operational problem solvers before moving on to algebra.

Basic Mathematics builds on the foundation set in grades 1–6 by the incremental review and practice of whole numbers, fractions, decimals, ratios, percents, and measurements. Students continue to practice their arithmetic skills by applying them to finances and mathematics in daily life. Units on statistics, algebra, plane and solid geometry introduce students to higher mathematics.

Word problems and the Problem Solving Strategies feature ensure that students can apply their mathematical skills to everyday situations, and it encourages them to connect varying types of mathematical knowledge. Skills development exercises and abundant practice problems help students to work quickly and accurately.

Evaluation

- Quizzes (34)
- Skills development exercises (54)
- Tests (8)
- 9-weeks exam (2)
- Semester exam
- Final exam

➤ **RED** indicates **NEW MATERIAL**

Numbers

- Place value:
 - Whole numbers to the 100 billions' place
 - Decimals to the millionths' place
- Writing numbers up to 100 billions
- Terms: notation, numeration, prime numbers, composite numbers
- Reading numbers
- Rounding: whole numbers, money, decimals
- Roman numerals:
 - Value of I, V, X, L, C, D, M
 - Rules for forming Roman numerals
- Prime numbers
 - Eratosthenes sieve
 - Prime pair, reciprocal
- Composite numbers
- Number line
- Signed numbers:
 - Reading and writing, zero as a reference point
 - Absolute value, comparing, adding, subtracting, multiplying, dividing
- Using number sense

Addition

- Terms: addend, sum
- Whole numbers, fractions, decimals, compound measures
- Signed numbers with and without a number line
- Checking by addition and by casting out 9s
- Mental arithmetic
- Timed mastery
- Arithmetic progression
- Word problems
- Principle: distributive
- Axiom

Subtraction

- Terms: minuend, subtrahend, difference
- Whole numbers, fractions, decimals, compound measures
- Signed numbers
- Checking by addition

- Mental arithmetic
- Timed mastery
- Word problems
- Axiom

Multiplication

- Terms: factors, partial product, product
- Whole numbers, fractions, decimals, compound measures, by powers of ten
- Signed numbers
- Checking by reversing factors and by casting out 9s
- Recognize symbol: \cdot (raised dot)
- Mental arithmetic
- Timed mastery
- Word problems
- Factors:
 - Finding common and greatest common factor
 - Prime factors
 - Prime factoring:
 - Division by primes
 - Factoring tree
 - Least common multiple
- Factorial
- Axiom

Division

- Terms: dividend, divisor, quotient, remainder
- Estimating quotients
- Whole numbers, fractions, decimals
- Compound measures
- By powers of ten
- Signed numbers
- Checking by multiplying and by casting out 9s
- Divisibility rules
- Divisors: 4 digits
- Division with end zeros
- Mental arithmetic
- Timed mastery
- Word problems
- Axiom

Basic Mathematics cont.

► RED indicates NEW MATERIAL

Fractions

- Terms: numerator, denominator
- Equivalent fractions
- Reducing
- Types:
 - Proper, improper, mixed
 - Complex
- Addition, subtraction, multiplication, division
- Timed mastery
- Word problems
- Simplifying complex fractions
- Changing fractions to decimals and decimals to fractions

Decimals

- Place value to the millionths' place
- Mixed
- Reading and writing
- Comparing
- Addition, subtraction, multiplication, division
- Timed mastery
- Word problems
- Rounding
- Money
- Multiplying and dividing by powers of ten
- Changing fractions to decimals
- Terminating, repeating
- Nonterminating and nonrepeating
- Converting repeating decimals to fractions

Ratios

- Terms: antecedent, consequent
- Reading and writing
- Equivalents
- Word problems

Proportions

- Terms: means, extremes
- Reading and writing
- Finding missing terms
- Word problems

Percents

- Recognize symbol: % (percent)
- Reading and writing:
 - Percent as a fraction, decimal
 - Decimals as a percent
 - Fractions as a percent
- Subtracting from 100%
- Percents over 100% and under 1%
- Percents ending in fractions
- Word Problems
- Finding:
 - Percentage of a whole number, money
 - Percents when given percentage and base
 - Percent of increase and decrease

- The base when given percentage and percent
- Discounts
- Commission, rate of commission, amount of sales
- Percent given as more or less than

Measures

- Metric prefixes
- Length:
 - English: inch, foot, yard, mile
 - Metric: millimeter, centimeter, decimeter, meter, decameter, hectometer, kilometer
 - Biblical: cubit, span, finger, fathom
- Capacity:
 - English: teaspoon, tablespoon, fluid ounce, cup, pint, quart, gallon, peck, bushel
 - Metric: milliliter, centiliter, deciliter, liter, decaliter, hectoliter, kiloliter
 - Biblical: log, hin, bath, ephah, homer, cor
- Time: second, minute, hour, day, week, month, year, leap year, decade, score, century, millennium
- Weight:
 - English: ounce, pound, ton
 - Metric: milligram, centigram, decigram, gram, decagram, hectogram, kilogram
 - Biblical: shekel, dram, menah, gerah, talent, mince, litra
 - Metric-English approximate relationships
 - Converting measures within the same system
 - Converting measures between English and metric systems
- Compound measures:
 - Adding, subtracting, multiplying
 - Dividing
- Square measures:
 - English: square inches, square feet, square yards, acres, square miles
 - Metric: square centimeters, square meters, hectares, square kilometers
- Timed mastery

Money & Finances

- Biblical: shekel, mite, dram, pence, farthing, talent, gerah
- Banking: checking and savings account
- Budgeting
- Borrowing money
- Insurance: life, health, homeowners, automobile
- Taxes: income, sales
- Income: salary, commission, piecework, tip
- Purchasing electricity and natural gas

Graphing, Statistics, & Probability

- Graphs:
 - Bar, pictograph, line, circle, rectangle
 - Histogram
- Statistics: range, mean, median, mode
- Finding probability
- Scale drawing: finding distance on maps

Basic Mathematics cont.

► RED indicates NEW MATERIAL

Pre-Algebra

- Algebraic expressions:
 - Terms, reading and writing
 - Operational order, equations
- One- and two-step equations: addition, subtraction, multiplication, and division axioms
- Using algebra to solve word problems
- Terms:
 - Variable
 - Base, exponent, root
 - Monomial, binomial, trinomial, polynomial
- Formulas expressed on tables and graphs
- Signed numbers
- Comparing, adding, subtracting, multiplying, dividing
- Absolute value
- Square roots:
 - Radical sign, perfect square
 - Extracting the square root
- Evaluating algebraic expressions
- Distributive principle
- Combining like terms
- Solving equations after simplifying
- Eliminating fractions in equations

Mathematical Geography

- Time:
 - Table of time: second, minute, hour, day, week, month, year, leap year, decade, score, century, millennium
 - Prime Meridian, International Date Line
 - Time zone conversions
 - Daylight Savings Time
 - Longitude and latitude, degrees
- Temperature:
 - Thermometer, degrees
 - Climate zones: torrid, temperate, frigid
 - Converting Celsius to Fahrenheit and Fahrenheit to Celsius
 - Temperature and altitude: finding the drop in temperature

Geometry

- Plane Geometry:
 - Symbols and definitions:
 - Point, line segment, congruent, line, ray, angle, vertex
 - Right angle, intersecting lines, perpendicular lines, parallel lines, plane
 - Geometric plane shapes:
 - Simple closed shape, similar shapes, congruent shapes
 - Polygon, triangle, quadrilateral, parallelogram, rectangle, square
 - Rhombus, trapezoid, pentagon, hexagon, heptagon, octagon
 - Perimeter of rectangle, parallelogram, square, triangle
 - Area:
 - Of rectangle, square, parallelogram, triangle
 - Of trapezoid
 - Angles:
 - Right, acute, obtuse, straight, in a circle
 - Measuring, constructing, and bisecting angles

- Triangles: right, isosceles, equilateral, sum of angles
- Using a compass and protractor
- Constructions:
 - Angles, bisecting angles
 - Perpendicular lines
- Using algebra in geometric problems
- Circle:
 - Center, radius, diameter, arc, semicircle, angle, vertex, degree
 - Circumference using diameter and radius formulas
 - Area
- Solid geometry:
 - Solid figures: rectangular solid, cube, triangular prism, square pyramid, cylinder, cone, sphere
 - Formulas for finding surface area of rectangular solid, cube, square pyramid, cylinder
 - Formulas for finding volume of rectangular solid, cube, square pyramid, cylinder, cone

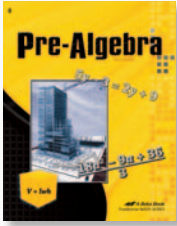
Trigonometry

- Terms: hypotenuse, legs, sine, cosine, tangent
- Pythagorean rule: finding length of hypotenuse and legs
- Finding the sine, cosine, and tangent using the formula and trigonometric ratios chart

Problem Solving & Applications

- Word problems:
 - Addition, subtraction, multiplication, division, fractions, decimals
 - Money, averages, proportions, percents, measures, time, graphs
 - Equations, trigonometry
 - Mixed operations
 - One- to four-step problems
 - Choosing the better method
 - Simplifying the problem
 - Reading a chart
 - Using algebra and formulas
 - Writing and solving a ratio
- Applications
- 13 Multi-step Problem Solving Strategies:
 - Percent:
 - Discount
 - Commission
 - Simple interest, profit, and loss
 - Measures
 - Adjusting recipes
 - Banking: checking and savings accounts, budgeting, borrowing money, installment buying
 - Insurance: life, health, homeowners, automobile
 - Taxes: income, sales
 - Income: salary, commission, piecework, tip
 - Comparative shopping: unit pricing
 - Purchasing electricity: current, kilowatt, reading electric meter
 - Purchasing natural gas: cubic feet, reading gas meter
 - Scale drawings: maps
 - Time: time zones
 - Geometry

Pre-Algebra Grade 8



Pre-Algebra completes the span of study between elementary arithmetic and the more advanced study of mathematics at the high school level. It not only provides mathematical tools for daily practical use, such as banking, graphs, statistics, and measurements, but is an excellent introduction to algebra, geometry, and trigonometry. Many links from arithmetic to algebra are highlighted throughout the book.

Frequent word problems and the Problem Solving Strategies feature ensure that students can apply their mathematical skills to real-life situations. The problems and strategies also encourage them to connect varying types of mathematical knowledge.

Evaluation

- Written quizzes (34)
- Skills development exercises (57)
- Tests (8)
- 9-weeks exam (2)
- Semester exam
- Final exam

➤ **RED** indicates **NEW MATERIAL**

Numbers

- Place value
- Terms: notation, numeration, whole numbers, prime, composite, natural (counting) numbers, integers, rational and irrational numbers
- Order of operations
- Rounding: whole numbers, decimals
- Roman numerals:
 - Value of I, V, X, L, C, D, M
 - Rules for forming Roman numerals
- Number sentences:
 - **Greater than and less than**
 - Order of operations (with and without parenthesis)
- Signed numbers
- **Scientific notation**

Addition

- Terms: addend, sum
- Whole numbers, fractions, decimals, compound measures, signed numbers with and without a number line
- **Principles:**
 - **Commutative, associative, identity**
 - Distributive
- Timed mastery
- Mental arithmetic
- Word problems

Subtraction

- Terms: minuend, subtrahend, difference
- Whole numbers, fractions, decimals, compound measures, signed numbers with and without a number line
- Timed mastery
- Mental arithmetic
- Word problems

Multiplication

- Terms: factors, product
- Recognize symbols: \times (multiplication sign); \cdot (raised dot)
- Whole numbers, fractions, decimals, by powers of ten, compound measures, signed numbers including two or more factors
- **Principles:**
 - **Commutative, associative, identity**
 - Distributive

- Factors:
 - Common and greatest common factor
 - Prime factoring: division by primes
 - Common and least common multiple
- Timed mastery
- Mental arithmetic
- Word problems

Division

- Terms: dividend, divisor, quotient
- Steps of division
- Whole numbers, fractions, decimals, by powers of ten, compound measures, signed numbers
- Timed mastery
- Mental arithmetic
- Word problems

Fractions

- Terms: numerator, denominator
- Types: mixed number, proper, improper, complex
- Equivalent
- Reducing
- Addition, subtraction, multiplication, division
- Simplifying complex fractions
- Changing fractions to decimals and decimals to fractions
- Word problems

Decimals

- Reading and writing
- Place value to the ten millionths' place
- Types: mixed, terminating, repeating, nonterminating, nonrepeating
- Comparing, rounding
- Addition, subtraction, multiplication, division
- Changing decimals to fractions, fractions to decimals
- **Scientific notation**
- Timed mastery
- Word problems

Pre-Algebra cont.

► RED indicates NEW MATERIAL

Ratios & Proportions

- Ratios:
 - Terms: antecedent, consequent
 - Reading and writing
 - Reducing and equivalents
 - Word problems
- Proportions:
 - Terms: means, extremes
 - Finding missing terms by cross multiplication
 - Word problems

Percents

- Recognize symbol: % (percent)
- Writing decimals as percents
- Percents less than 1% and more than 100%
- Percent given as more or less than
- Finding:
 - The percentage, percent, and base using decimal methods
 - The percentage, percent, and base using ratio methods
- Percent of increase and decrease
- Discount, rate of discount, sale price, commission, rate of commission
- Percent of profit and loss based on cost and on selling price

Measures

- Linear:
 - English: inch, foot, yard, mile
 - Metric: millimeter, centimeter, decimeter, meter, decameter, hectometer, kilometer
 - Biblical: reed, cubit, span, finger
- Capacity:
 - English: teaspoon, tablespoon, fluid ounce, cup, pint, quart, gallon, peck, bushel
 - Metric: milliliter, centiliter, deciliter, liter, decaliter, hectoliter, kiloliter
 - Biblical: homer, ephah, cor, bath, hin, log
- Weight:
 - English: ounce, pound, ton
 - Metric: milligram, centigram, decigram, gram, decagram, hectogram, kilogram
 - Biblical: talent, menah, shekel, dram
- Time:
 - Second, minute, hour, day, week, month, year, leap year, decade, century, millennium
 - Time zones
- Speed: formula to compute speed, distance, and time
- Money:
 - Biblical: talent of pure gold, talent, menah, shekel, pence, farthing, mite
- Square measures:
 - English: square inches, square feet, square yards, square miles, acres
 - Metric: square centimeters, square meters, hectares, square kilometers
- Cubic measures:
 - English: cubic inches, cubic feet, cubic yards
 - Metric: cubic centimeters, cubic meters

- Temperature:
 - Degree
 - Fahrenheit and Celsius: freezing and boiling points of water and normal body temperature
 - Converting Celsius to Fahrenheit and Fahrenheit to Celsius
 - Temperature zones
- Compound measures: adding, subtraction, multiplying, dividing
- Converting measures within the same system and from metric to English and English to metric
- Metric-English approximate equivalents

Algebra

- Terms:
 - Variables
 - Numerical and literal coefficients
- Terms, polynomial, monomial, binomial, trinomial, base, exponent
 - Surd
 - Like and unlike terms
- Reading and writing algebraic expressions
- Adding and subtracting like terms
- Order of operations
- Evaluating algebraic expressions
- Multiplying monomials, polynomials by monomials, polynomials by polynomials
- Dividing monomials, polynomials by monomials
- Equations:
 - Addition, subtraction, multiplication, division axioms
 - Eliminating fractions
 - Eliminating decimals
- Using algebra to solve word problems
- Formulas expressed by tables and graphs
- Signed numbers:
 - Zero used as reference point
 - Signs of operation and direction
 - Absolute value
 - Comparing, adding and subtracting with and without the number line, multiplying, and dividing
 - Evaluating algebraic expressions with signed numbers
 - Combining like terms with signed numbers
- Square root:
 - Terms: radical sign, radicand, index, principal square root, perfect square
 - Extracting the square root
- Simplifying irrationals
- Word problems

Graphing, Statistics, Probability

- Terms: data, statistics, rank, range, graph
- Graphs:
 - Pictograph, bar, line, circle, rectangle, histogram
 - Scale drawing and finding distance on maps
- Statistics: mean, median, mode
- Probability:
 - Formula
 - Probability of independent data

Pre-Algebra cont.

► RED indicates NEW MATERIAL

Business Mathematics

- Terms: employers, employees
- Income: salary, hourly, piecework wages, commission, tips, gross pay, net pay
- Taxes:
 - Income
 - Property
 - Sales
- Budget
- Banking:
 - Check, deposit slip, balancing checkbook
 - Reconciling monthly statements
- Borrowing money:
 - Simple interest, installment buying
 - Constant ratio formula
- Compound interest formula
- Buying bonds and stocks
- Insurance: life, health, fire, automobile

Geometry

- Models and symbols:
 - Point, line, line segment, ray, angle, parallel lines, perpendicular, right angle
 - Similar to, congruent to, arc
 - Triangle
- Plane geometric figures:
 - Curve, closed curve, simple closed curve, polygon, triangle
 - Quadrilateral, parallelogram, rectangle, rhombus, square, trapezoid
 - Pentagon, hexagon, heptagon, octagon, circle
- Lines:
 - Line, line segment, ray, intersecting, perpendicular
 - Skew
- Angles:
 - Terms: sides, vertex, degree
 - Types:
 - Right, acute, obtuse, straight
 - Reflex, central
 - Adjacent
 - Congruent
 - Vertical, complementary, supplementary
 - In a circle
 - Measuring, constructing
- Using a compass and protractor
- Circle:
 - Terms:
 - Center, radius, diameter, arc, semicircle
 - Chord

- Triangles:
 - Types:
 - Acute, obtuse
 - Right, equiangular, equilateral, isosceles
 - Scalene
 - Similar, congruent
- Constructions:
 - Angles, bisecting angles
 - Line segments, congruent angles
 - Line perpendicular to a given line segment, parallel lines
 - Triangles when given length of three sides, given two angles and included side and, given two sides and the included angle
- Perimeter: polygon, rectangle, square, triangle
- Circumference: formulas when given diameter or radius
- Area: rectangle, square, parallelogram, triangle, trapezoid, circle
- Geometric solid shapes:
 - Prism, rectangular prism, cube, triangular prism, pyramid, square pyramid, cylinder, cone, sphere
 - Surface area: rectangular prism, cube, square pyramid, cylinder
 - Volume: rectangular prism, cube, square pyramid, cylinder, cone

Trigonometry

- Terms: hypotenuse, legs, sine, cosine, tangent
- Pythagorean formula: to find length of hypotenuse and legs
- Finding sine, cosine, tangent using formulas and trigonometric table

Problem Solving & Applications

- Word problems:
 - Addition, subtraction, multiplication, division, rounding, fractions
 - Decimals, ratios, proportions, measures, percent, time, graphs
 - Statistics, probability, maps, commission, gross pay
 - Net pay, taxes, budget, interest
 - Buying stocks and bonds
 - Insurance, geometry, trigonometry
 - Scientific notation
 - One-, two-, and three-step problems
- Applications:
 - Making change, unit pricing, percent of discount, commission
 - Profit, loss
 - Measures, time zones
 - Wind chill factor
- Banking:
 - Writing checks, filling out deposit slips, balancing a checkbook
 - Reconciling monthly statements, buying stocks and bonds
 - Insurance, taxes
- Mental arithmetic: problems combining addition, subtraction, multiplication, and division with up to 18 numbers
- 13 Multi-step Problem Solving Strategies

Algebra 1 Grade 9



Algebra is an extension of arithmetic, and the concepts and procedures of arithmetic are used as the foundation upon which the study of algebra is built. Algebra supplies the language and patterns of reasoning used in the sciences and other branches of knowledge. Algebraic axioms are used to form and solve equations.

Algebra 1 uses mathematical ideas in solving problems ranging from everyday applications to applications in the physical and biological sciences.

Supplementary Exercises

- Progress test, improvement test, and test for high rank at end of each chapter
- Exercises at end of text:
 - Graphing, addition and subtraction, parentheses
 - Multiplication, division, special cases in multiplication, factoring
 - Fractions, equations involving fractions
 - Ratios and proportions, formulas
 - Exponents and radicals, quadratic equations
 - General review, general review tests, final review

Evaluation

- Quizzes (57)
- Tests (8)
- 9-weeks exam (2)
- Semester exam
- Final exam

➤ **RED** indicates **NEW MATERIAL**

Introductory Processes

- Using letters, notation
- Making algebraic statements from words, solving word problems

Algebraic Numbers

- Terms, coefficients, factors, variables
- Products:
 - With multiple factors
 - With signed factors
- Monomials, binomials, trinomials, polynomials
- Combining terms, exponents
- Degree of a term
- Order of operation: addition and subtraction, multiplication and division, parentheses

Graphs

- Number line, scale, reading graphs
- Horizontal and vertical axes
- Bar graphs, circle graphs
- Curved-line graph
- Broken-line graph, line graph

Formulas & Equations

- Used to make a table, an arithmetic rule
- Used as an algebraic statement
- Graphing, variables, constants, functions
- Substituting values
- Solving:
 - Uniform motion
 - Velocity
 - Acceleration, momentum, force, temperature conversions
- Degree of a term, degree of an equation
- Solving equations
- Word problems
- Rules for solving equations

Numbers

- Accuracy, significant figures, rounded numbers
- Positive and negative numbers, absolute value
- Addition and subtraction using the number line
- Algebraic sums, prime numbers

Operations

- Axioms: subtraction, division, addition, multiplication, equality, substitution
- Adding and subtracting monomials
- Adding and subtracting polynomials
- Solving equations, checking solutions
- Using parentheses, grouping terms
- Product of monomials, monomial and a polynomial, polynomials
- Division of monomials, a polynomial by a monomial
- Division of a polynomial by a polynomial
- Word problems
- Rules for operations

Products

- Prime numbers
- Similar binomials, binomials with a common term
- FOIL, squaring binomials
- Sum and difference of two numbers
- Word problems
- Rules for operations

Factoring

- Expressions with a common factor
- Trinomials that are products of similar binomials
- Trinomials that are squares
- Difference of two squares
- When either square is a square of a polynomial
- By finding prime factors
- Word problems
- Rules for operations

Algebra 1 cont.

➤ RED indicates NEW MATERIAL

Fractions

- Review of numeric fractions:
 - Nature of, multiplication of
 - Numerator and denominator
 - Proper and improper fractions, mixed numbers and complex fractions
 - Reducing to lowest terms, adding and subtracting
 - Changing mixed numbers to fractions
 - Multiplying and dividing, simplifying complex fractions
 - General principles and terminology

Algebraic Fractions

- Reducing, reducing to lowest terms, simplifying
- Greatest common factor
- Changing to: a required denominator, a mixed expression, least common denominator
- Addition and subtraction, multiplication and division
- Reciprocals
- Complex fractions
- Clearing equations of fractions
- Word problems with fractions
- General principles

Ratios, Proportions, & Variation

- Definitions, terms
- Variable, constant
- Mean proportional
- Word problems
- General principles

Linear Equations

- Defined
- Members
- Solving by inspection, by axioms, roots
- As word statements
- Graphs
- Integral and fractional equations, solution of literal equations
- Word problems
- General principles

Linear Systems of Equations

- Graphing and terms: point of intersection, origin, abscissa, ordinate, coordinates, quadrants, axes
- Graphs of linear equations
- Equations: indeterminate, dependent, independent, simultaneous, inconsistent
- Solution of linear equations: graphic, algebraic
- Elimination by addition and subtraction, by substitution
- Systems of linear equations
- Checking algebraic solutions by graphing
- Solving word problems
- General principles

Powers & Roots

- Terms
- Squares and square roots:
 - Radical sign, radicand
 - Principal square root, principal root
- Powers of number raised to a power, positive numbers, a product, fractions, polynomials
- Roots of numbers, of monomials
- Square root of a polynomial:
 - By extraction
 - By estimation
- Cube roots by factoring
- Using a calculator to find powers and roots
- General principles

Exponents & Radicals

- Notation, radical, radicand
- Order of an expression
- Numbers with:
 - Exponent of zero
 - A negative exponent, a fractional exponent
- Graphic representation of second order radicals
- Rational and irrational numbers
- Simplifying radical expression, reducing radical expressions
- Reducing the index of a root, reducing radicals to the same order
- Radicals: addition and subtraction, multiplication and division, finding powers
- Rationalizing a denominator
- General principles

Quadratic Equations

- First degree and quadratic equations
- Graphic solution of quadratic equations: parabolas and a minimum point
- Algebraic solution of incomplete quadratic equations
- Formulas
- Algebraic solution of complete quadratic equations
- Solving by completing the square, using the quadratic formula
- Miscellaneous quadratic equations
- Word problems
- General principles

Geometry

- Isosceles triangle, square, rectangle, cube, parallelogram, trapezoid
- Circle, right triangle, regular polygon, rectangular solid, cone
- Pyramid, cylinder of revolution, sphere

Algebra 1 cont.

➤ RED indicates NEW MATERIAL

Geometry cont.

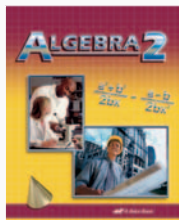
- Perimeter, area, volume, Pythagorean theorem, altitude
- Circumference, diameter, radius
- Similar figures
- Proportional lengths, areas
- Proportional areas and volumes of similar solids

Trigonometry

- Vertex, angle, degrees, types of angles
- Protractor and types of triangles
- Sum of the angles of a triangle

- Pythagorean theorem
- Similar figures:
 - Relationships of corresponding sides
 - Relationships of corresponding angles
- Trigonometric ratios:
 - Tangent, sine, and cosine
 - Angles of elevation and depression
 - Special triangles: 30° - 60° - 90° ; 45° - 45° - 90°
- Solving right triangles
- Using a table
- Interpolation of values of a function using a table
- Using a calculator

Algebra 2 Grade 10



Algebra 2 presents a thorough review of elementary algebra and will help the student acquire important manipulative algebraic skills. Students will develop self-reliance and confidence in their accuracy by repeated insistence on the checking of algebraic solutions. The students' understanding of the algebraic concepts will advance to prepare them for further study in mathematics.

Supplementary Exercises

- Progress test and improvement text at end of each chapter
- For Experts Only test at end of most chapters
- Historic character interest stories: Robert Recorde, Sir Isaac Newton, René Descartes, Leonhard Euler, Albert Einstein
- Algebra in Action—Interest Scenarios: Kinetic Energy, Medicine, Air Resistance and Bicycles, Rope Strength, Hull Speed, Is it likely to rain?

Evaluation

- Quizzes (46)
- Tests (8)
- 9-weeks exam (2)
- Semester exam
- Final exam

➤ RED indicates NEW MATERIAL

Introductory Review

- Words as algebraic expressions
- Terms and symbols
- Number line
- Order of operations
- Addition and subtraction of polynomials
- Equations involving addition and subtraction
- Inequalities involving addition and subtraction
- Word problems

- Multiplication and division of polynomials
- Special cases of multiplication
- Synthetic division
- Special cases of division
- Solving equations and literal equations
- Solving inequalities
- Algebraic representation
- General principles

Algebra 2 cont.

► RED indicates NEW MATERIAL

Factoring

- Review factor, prime factor, monomial factors
- Perfect square trinomials
- Difference of two squares
- Sum or difference: of two cubes, of the same odd powers
- Difference of even powers of two numbers
- Quadratic trinomial, general quadratics
- Polynomials with common polynomial factors
- Making a perfect square trinomial for factoring
- Applying by solving equations
- General principles

Rational Expressions & Equations in One Variable

- Signs in fractions
- Rational numbers and expressions
- Equivalent fractions
- Lowest term
- Reducing a fractional algebraic expression
- Least common denominator of algebraic fractions
- Addition and subtraction of algebraic fractions
- Multiplication and division of algebraic fractions
- Complex algebraic fractions
- Equations in one variable:
 - Root of, extraneous root
 - Rational and non-rational
 - Linear form
- Clearing equations of fractions
- Literal equations
- Formulas of
- General principles

Coordinate Geometry

- Graphs:
 - Coordinate plane
 - x-axis, y-axis, origin
 - Abscissa, ordinate
 - Rectangular coordinates, quadrants
 - x-intercept, y-intercept
- Using graphs to solve word problems
 - Graphing linear equations by table
 - Graphing linear equations by slope-intercept form
- Graphing linear inequalities
- Slope:
 - From two points
 - Variation, undefined
 - Perpendicular and parallel lines
- Distance between two points
- Pythagorean theorem
- Midpoint
- Equation of a line using two points, point-slope form

Variation & Dependence

- Variables: independent, dependent
- Constants, functions
- Domain, range
- Ratios
- Proportions:
 - Means, extremes
 - Fundamental law of proportions
- Variation:
 - Direct, inverse
 - Applied to geometric solids
 - In construction of formulas
 - Empirical formulas
- Graphs of variation
- Word problems

Systems of Equations

- Simultaneous equations: elimination by addition and subtraction, by substitution
- Systems of literal equations
- With three unknowns
- General principles
- Word problems

Powers & Roots

- Power
- Root:
 - Index of
 - Odd or even root
 - Square, cube
 - Real, imaginary
 - Principal
- Binomial theorem
- Pascal's triangle
- Finding the n^{th} term of an expansion of $(a + b)^n$
- Square root of a polynomial
- Finding roots by factoring
- Finding powers and roots using a calculator
- Word problems
- General principles

Exponents, Radicals, & Imaginary Numbers

- Exponent theory: general principles, zero, negative values, fractional values
- Operations
- Scientific notation
- Reduction of radicals: radicand, order, rational and irrational numbers
- Reducing radicals to the same order
- Addition, subtraction, multiplication, and division of radicals

Algebra 2 cont.

► RED indicates NEW MATERIAL

Exponents, Radicals, & Imaginary Numbers cont.

- Rationalization:
 - Factors
 - Denominators
 - Conjugate
- Powers of radicals
- Roots of radicals
- Applications
- Radical equations
- Imaginary and complex numbers:
 - Fundamental property of imaginaries, powers of i
 - Graphic representation, standard form
- Number theory: natural numbers, fractions, positive and negative numbers
- Word problems
- General principles

Quadratic & Higher Equations

- Quadratic equations:
 - Defined
 - Coincident and imaginary roots
 - Minimum points
- Solving incomplete and complete quadratics:
 - Factoring, completing the square, quadratic formula
 - General direction
- Literal equations
- Radical equations leading to quadratics
- Equations in quadratic form:
 - Graphing:
 - Circles
 - Parabolas
 - Ellipses, hyperbolas
 - Systems of equations
- Solving systems of equations involving quadratics
- The nature of roots of quadratics: discriminant, real or imaginary, equal or unequal
- Solving polynomials of degree three or greater:
 - Zeros, factor theorem, graphs, imaginary factors
 - Factors of n^{th} order polynomials
- Word problems
- General principles

Logarithmic, Exponential, & Rational Functions

- Introduction:
 - Logarithms, base
 - Common logarithms, natural logarithms
 - Calculators
- Converting between exponential and logarithmic form:
 - Exponential equations
 - Logarithmic equations

- Domain and range of logarithmic functions
- Logarithm properties: products, quotients, powers
- Antilogarithms: original number, calculators
- Applications: decibels, star magnitude, the pH scale
- Exponential functions:
 - Form, graphs, asymptotes
 - Domain and range
 - Simple and compound interest
- Solving exponential and logarithmic equations
- Graphs
- Rational functions: vertical and horizontal asymptotes
- General properties

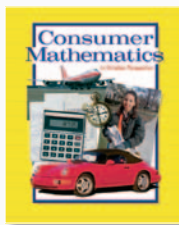
Trigonometry

- Angle properties
- Measuring tiny angles: minutes and seconds
- Triangle properties:
 - By angle measure
 - Sum of angles
 - Pythagorean theorem, similar triangles
- Trigonometric functions:
 - Of acute angles
 - Of special angles:
 - 30°-60°-90° triangle
 - 45°-45°-90° triangle
 - Triangle solutions
 - Angles of elevation and depression
 - Function values using a calculator
 - Of non-acute angles
- Law of sines, cosines
- Word problems

Statistics & Probability

- Measures of central tendency:
 - Mean, median, mode
 - Bimodal, multimodal
- Measures of dispersion: range, standard deviation
- Normal distribution, frequency distribution
- Histogram
- Counting, permutations, and combinations: theory and formulas
- Probability of a single event
- Mutually and non-mutually exclusive events
- Probability of multiple events:
 - Independent events
 - Dependent events

Consumer Mathematics Grade 10



No student studying *Consumer Mathematics* is tempted to ask, Why do I have to learn this? No other math course is as clearly related to knowledge and skills that are a must for every person. Percents, proportions, fractions, decimals, word problem skills, and many other concepts are fun to learn in the practical setting of buying a car, food, house, clothing, insurance, etc.

Consumer tips are given frequently, but most importantly, biblical principles are highlighted throughout the text.

Supplementary Exercises

- Analytical Skills Problem Solving Scenario within each chapter
- Skills and Review Exercises Workbook to be used simultaneously with the text for homework and review:
 - Daily practice exercises for maintenance of basic mathematics skills
 - Unit and exam review exercises

Evaluation

- Quizzes (35)
- Tests (8)
- 9-weeks exam (2)
- Semester exam, final exam
- Skills development exercises (optional—12)

➤ **RED** indicates **NEW MATERIAL**

Buying a Car

- Cost of a car: warranty, trade-in, options, advertisements, taxes and fees, registration and rates
- Financing: installments, installment charge, carrying charge, contract
- Depreciation: average annual depreciation, rate of depreciation
- Insurance:
 - Liability
 - Bodily injury, property
 - Collision, comprehensive
 - Deductible, premium
 - Maintenance and repair: owner's manual, service manual, trunk essentials
 - Annual operating cost
 - Leasing:
 - Open-ended lease, closed-ended lease
 - Lessee, lease agreement
 - Word problems

Travel

- Times zones: prime meridian, international date line
- By train or bus, renting a car
- Word problems

Income

- Hourly wages, straight time, overtime, time and a half, piece-work wages
- Employers, employees
- Time clocks
- Incentive bonus
- Tips, salary
- Commission: rate of commission, amount of sales
- Self-employment, fees
- Gross income, net income

- Deductions:
 - Federal income tax
 - Social security tax, FICA
- Gross pay, net pay, take-home pay
- Word problems

Budgeting

- Time budget
- Circle graph: steps in preparing, protractor
- Household budget:
 - Itemizing to estimate expenses
 - Balancing the budget, trial budget
- Budget adjustments
- Standardized budgets
- Disposable income
- Word problems

Housing

- Renting versus buying: security deposit
- Mortgage loans:
 - Principal, balance
 - Mortgage loan schedule
 - Property tax
 - Assessed value, market value
- Tax rate: as a percent, amount per \$100, per \$1,000, in mills
- Homeowner's insurance:
 - Tenant's policies
- Repairs and upkeep
- Furnishing costs
- Purchasing electricity: kilowatt-hour, electric company rates, reading the electric meter
- Purchasing natural gas: gas meter, cubic foot, hundred cubic feet, natural gas rates
- Other utility expenses: water rates, wastewater rates

Consumer Mathematics cont.

➤ RED indicates NEW MATERIAL

Housing cont.

- Telephone rates: local service, long distance
- Word problems

Food

- Buying food
- Grocery shopping tips
- Reading graphs
- Unit price, using unit price
- Conversion equivalents
- Inflation
- Consumer price index
- Cost of living:
 - Cities ranked by cost of groceries
 - Range statistic
- Circle graph
- The metric system: conversions
- Restaurant eating: table service, fast food, chain, franchise, franchiser, eating-out tips, junk food
- Food freezers
- Saving food dollars: coupons
- Food labeling and nutrition
- U.S. Food and Drug Administration
- Measuring calories:
 - Calorie, kilocalorie
 - Calorie need: based on age, on occupation
 - Calorie content of selected foods
- Using calories
- Balanced diet
- Word problems

Clothing

- Clothing plan
- Buying clothing by mail: shipping charges
- Stretching the clothing budget: clothing quality, care
- Sewing your own clothing
- Buying clothing on sale:
 - Discount
 - List price
 - Rate of discount
- Consumer price index for clothing
- Price changes
- Profit and loss in the clothing business:
 - Cost, selling price, gross profit, net profit, overhead, loss
 - Selected business formulas: gross profit, net profit, loss
- Operating statement: net sales, gross profit, net profit
- Markup on cost, finding selling price based on markup on cost
- Markup on retail price, finding cost based on markup on retail

- Manufacturer's cost: wholesale price, total factory cost, factory overhead, cost of a garment
- Word problems

Leisure

- Taking a vacation
- Shopping
- Enjoying the computer:
 - Program, programmer, microcomputer, history of, analog computers, digital computers
 - Bit, binary, conversions
- Cooking:
 - Recipes: conversions, adjustments
- Reading books:
 - Roman numerals in copyright
- Church activities
- Word problems

Federal Taxes & Records

- Social security tax
 - Federal Insurance Contribution Act (FICA)
- Medicare
 - Federal income tax
 - Progressive tax
- W-4 form
 - Exemptions, dependents
- Withholding allowance
- Income tax return:
 - W-2 form
 - 1040 EZ, 1040A, 1040
- Joint return, separate return
- Head of household
 - State income tax:
 - Sample state tax rates
- Cash records:
 - Audited
 - Cash receipt record, cash payment record
- Comparing receipts and payments: deficit
- Cash payment records
- Word problems

Banking

- Electronic transfer
- Demand deposit
- NOW accounts, super-NOW accounts, money-market accounts
- Depositor
- Monthly service charge
- Bank balance

Consumer Mathematics cont.

► RED indicates NEW MATERIAL

Banking cont.

- ATM, PIN
- Deposit slips
- Writing checks:
 - Check stubs, register
 - Overdraft
- Reconciling the bank statement:
 - Canceled checks
 - Outstanding checks
- Borrowing money:
 - Promissory note, signature loan, unsecured loan, collateral, secured loan
 - Interest: simple interest, principal, rate of interest, time
- Installment plans: finance charge, percent of interest
- Constant ratio formula
- Credit cards:
 - Active, credit line
 - Savings account
- Compound interest:
 - Exponent, base
- Certificates of deposit, savings bonds, series EE savings bonds, maturity date
- Related bank services: safety deposit box, cashier's check, certified check, traveler's checks, debit card, online banking
- Word problems

Investments

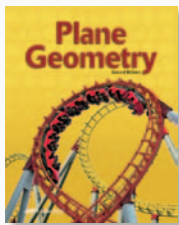
- Life insurance:
 - Rider, term insurance, lifetime insurance, endowment insurance
 - Straight life, limited payment life, premiums
- Life insurance benefits:
 - Cash value
 - Borrowing, extended term, accelerated death benefit, dividend
- Life insurance settlement options:
 - Lump sum payment
 - Annuity: fixed amount, fixed number of years, lifetime, guaranteed life annuity
- Buying bonds:
 - Bondholder, par value, premium, discount, broker, brokerage fee
 - Wall Street Journal, quoted price, net change
- Interest paid on bonds: annual yield
- Proceeds from bonds:
 - Accrued interest
 - Using a calculator

- Buying stock:
 - Liquid money
 - Common stock, preferred stock, dividends, par value
 - No-par stock
 - Market price
 - Price to earnings ratio, net change
- The stockbroker:
 - Round lots, odd lots
 - No-load stocks
 - Brokerage fees for stock
- Dividends from stock:
 - Cash dividends, stock dividends
- Capital gains and losses on sale of stock:
 - Bull market, bear market
 - Capital gain, capital loss
- Word problems

Small Business

- Beginning a small business:
 - Entrepreneur
 - Capital, owner capital, creditor capital
 - Standard business ratio
 - Expenses, assets and liabilities, resources
 - Net worth
 - Owner's equity
- Balance sheet:
 - Current assets, fixed assets
 - Current liabilities, fixed liabilities
 - Horizontal format
 - Balance
- Ratio analysis: current ratio, quick ratio, acid-test ratio
- Income statement:
 - Net profit, net loss
 - Percent analysis
- Ratios related to sales:
 - Average collection period
 - Inventory turnover
 - Average daily sales, annual sales
- Payroll record: employees' quarterly federal tax returns
- Break-even point analysis: fixed costs, variable costs
- Trade discounts:
 - List price, gross selling price
 - Chain discount
- Trade credit: percent of discount, discount period, net, credit period, invoice dates, E.O.M
- Storage and inventory:
 - Volume
 - Inventory
- Word problems

Plane Geometry Grade 11



Plane Geometry teaches students how to use known facts to verify the truth of additional facts, to solve geometric problems, and to use deductive reasoning for drawing correct conclusions. Students learn to think *naturally, logically, and systematically* whenever they encounter a proof to write, a construction to make, or a problem to solve. They are then equipped throughout life to perform such tasks as determining which car is the better buy or identifying truth and flaws in politics.

Topical Interest Essays

- Geometry Past and Present; Geometry and the Pyramids
- Euclid, Master of Logic; Geometry and Solomon's Temple
- Archimedes, Greatest Mathematician of Antiquity
- Geometry and the Parthenon; Blaise Pascal, Inventor, Mathematician, Writer
- The Golden Ratio; Leibniz, Universal Genius
- Notre Dame de Paris; Isaac Barrow, Teacher, Friend of Isaac Newton
- Kaleidoscope; Sir Christopher Wren, Mathematician and Architect
- The value of π ; Symmetry in Nature

5 Final Review Exercises

Quick Reference & Summaries

- Conversion tables, plane geometry notation and formulas
- Basic mathematics axioms, geometry principles, postulates, and informal statements
- Theorems and corollaries, properties of proportions, transformations
- Constructions, proof methods, factual summaries

Evaluation

- Quizzes (50)
- Tests (8)
- 9-weeks exam (2)
- Semester exam
- Final exam

➤ **RED** indicates **NEW MATERIAL**

Introduction to Geometry

- Geometry defined
- Principles, informal statements, axioms, postulates
- Fundamental definitions: equal segments, midpoint, trisection
- Angles:
 - Equal, bisector
 - Perigon
 - Straight angle, adjacent, right, perpendicular lines, acute, obtuse, reflex
 - Oblique
 - Complementary, supplementary, vertical
 - Measuring angles; degrees, minutes, seconds; protractor; compass
- Triangle:
 - Defined, vertices, base, exterior angle
 - Opposite interior angle, median
 - Altitude, scalene, isosceles, equilateral, acute, obtuse, right, equiangular, sum of angles
- Polygon:
 - Defined
 - Base, adjacent sides, diagonal, convex, concave, sum of angles, regular, center
- Circle:
 - Defined, center, circumference, diameter, radius
 - Chord, arc, semicircle, quadrant
- Congruence:
 - Defined
 - Corresponding parts
- Constructions:
 - Perpendicular bisector, angle bisector, angle
 - Perpendicular at a point

- Perpendicular from a point
- Triangle given three sides, one side and adjacent angles, two sides and included angle
- Optical illusions, deduction
- Euclid's *Elements*
- Numeric applications

Rectilinear Plane Figures

- Demonstrative proof: defined, demonstrated, given, prove, analysis, proof, theorem, corollary
- Triangles congruent by:
 - SAS
 - LL
 - ASA
 - LA
 - SSS
 - HA, SAA, HL
- Triangle sides-angles relationships:
 - Isosceles triangle, equilateral, equiangular
 - Exterior-exterior angle, opposite sides-angles
- Auxiliary lines, direct and indirect method of proof
- Parallel lines
- Parallel postulate and corollary
- Transversal formed
- Angles formed, angle relationships
- Proving lines parallel
- Proving angles equal, supplementary, complementary
- Triangle relationships:
 - Sum of angles
 - Exterior-opposite interior angles

Plane Geometry cont.

► RED indicates NEW MATERIAL

Rectilinear Plane Figures cont.

- Acute angles of right triangle
- 30° - 60° - 90°
- Unequal lines and angles, perpendicular lines, triangles with unequal lines and angles
- Distance defined between two points, two lines, a line and a point
- Parallelograms and quadrilaterals:
 - Defined, base, altitude, rhombus, rectangle, square
 - Relationships of sides, angles, diagonals, shapes formed
 - Proving a quadrilateral is a parallelogram
 - Segments intersected by parallel lines
- Trapezoid:
 - Defined, legs
 - Median
 - Altitude
 - Isosceles
- Polygons:
 - Defined
 - Sum of exterior angles, sum of interior angles
 - Each angle measure, formulas
- Concurrent lines of a triangle:
 - Defined, altitudes
 - Angle bisectors, perpendicular bisectors of sides, medians
- Proof reasoning methods (critical thinking skills): analytic, synthetic, general method
- Inequality axioms
- Numeric applications

The Circle

- Relationships of equal arcs, central angles, and chords; unequal arcs, central angles, and chords; chord distances from center
- Diameter-chord relationships, perpendicular relationships
- Inscribed and circumscribed polygons
- Tangent lines and relationships, common tangents
- Tangent and intersecting circles, common chord, concentric circles
- Measuring angles and arcs, inscribed angles, semicircles
- Angles formed by combinations of chords, tangents, secants
- Constructions and proofs:
 - Reviewed
 - Bisect arc
 - Parallel lines
 - Divide a line into n equal parts
 - Circumscribe a circle, inscribe a circle, tangent to a circle
 - Circle from various givens, triangle from various givens
- Locus:
 - Definitions and drawings
 - Fundamental locus theorems:
 - Equidistant and given distances from various points
 - Intersecting and parallel lines
 - Centers of circles tangent to a line, etc.
 - Intersecting loci
- General directions for constructions

Proportions & Similar Polygons

- Definitions: ratio, antecedent, consequent, proportion, extremes, means
- Fourth proportional
- Mean proportional
- Third proportional, continued proportion
- Fundamental properties: product of means and extremes, writing proportions
- Like-powers axioms
- Finding a mean proportional
- Transformations: alternation, inversion, addition, subtraction, like powers
- Proportional segments: by parallel lines, by angle bisectors
- Similar polygons, corresponding sides
- Corresponding angles, ratio of similitude
- Proving triangles similar aaa , aa , sas , ll , sss
- Proportional line proofs: in triangles, with parallel lines, in right triangles, in circles
- Pythagorean theorem proved
- Similar polygons:
 - Proportional sides, perimeters, diagonals, corresponding lengths
 - Similarity of corresponding triangles
- Construction of proportional segments and polygons: fourth proportional, a given proportional, mean proportional
- Projection
- Numeric applications

Surface Measurement

- Defined, equal figures, constant, variable
- Limit
- Area mensuration formulas for rectangle, square, parallelogram, triangle, trapezoid
- Area proportions for rectangle, square, parallelogram, triangle, trapezoid
- Areas of similar triangles and similar polygons
- Pythagorean theorem:
 - By areas of squares, by area of similar polygons
- Construction of equal non-similar shapes
- Transforming plane figures
- Numeric applications

Regular Polygons & Circles

- Defined
- Inscribed and circumscribed, chords, tangents, midpoints
- Inscribed and circumscribed circles
- Angle at center of n -gon
- Ratios regarding similar polygons: perimeters, corresponding sides, areas, radii, apothems
- Area formula
- Circle proportions
- Formulas to measure:
 - Circumferences, radii, diameters
 - π

Plane Geometry cont.

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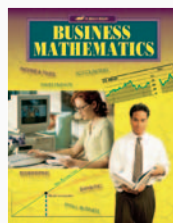
Regular Polygons & Circles cont.

- Arc length using angles in degrees
- Sectors, segments, similar sectors and segments
- Constructions: inscribing a square, regular polygons
- Numeric applications including 30° - 60° - 90° , 45° - 45° - 90°

Trigonometry

- Defined
- Graphic solutions
- Right triangle solutions
- Sine, cosine, tangent, ratios, functions of angles in degrees
- Interpolation, angles of elevation and depression
- Numeric applications

Business Mathematics Grade 11



Business Mathematics in Christian Perspective introduces secondary students to beginning accounting procedures and gives valuable insight into the world of investments. At the same time, the course reviews and expands students' understanding of basic mathematic principles, concepts, and skills. Students use arithmetic, algebra, and geometry as tools to make better financial decisions and to gain an understanding of the workings of business.

The excellent balance of skills practice and problem solving meets the needs of the varying abilities of the students. Students increase their understanding of good investment practices and the stock market. The daily Basic Mathematics Practice Exercises review the fundamentals of mathematics while challenging the students with interesting word problems and concepts that may be new to them. These exercises require students to apply and connect various types of mathematical knowledge. Bible principles regarding finance are set forth throughout this textbook.

Evaluation

- Quizzes (34)
- Skills development exercises (54)
- Tests (8)
- 9-weeks exam (2)
- Semester exam
- Final exam

➤ RED indicates NEW MATERIAL

Stewardship

- Keeping money records
- Accounting, bookkeeping
- Cash receipts and payment records
- Terminology:
 - Addends, sum, minuend, subtrahend
 - Difference, multiplicand, multiplier
 - Product, factor, dividend, divisor, quotient
- Assets, liabilities, capital:
 - Accounts receivable, accounts payable
 - Creditor
 - Accounting equations
- Balance sheet
- Income, cost of goods sold, operating expenses
- Profit, loss: net sales, gross profit, equations
- Corporation: average owner's equity, return on equity
- Income statement
- Debits and credits:
 - Assets, liabilities, capital
 - Income, cost of goods, expenses
 - Journal, double-entry bookkeeping system, debit entry, credit entry, "T" accounts

- General journal: debit and credit entries and totals
- General ledger: chart of accounts
- Practical exercise application problems
- Word problems
- General principles
- Unit review

Managing Your Business

- Ratio analysis:
 - Ratio, antecedent, consequent
 - Current ratio, quick ratio
 - Liquidity of assets, current liabilities
- Percent analysis:
 - Percent, cost of goods sold, gross profit, operating expenses, net profit
 - Proportion, means, extremes, algebraic axioms
- Average collection turnover:
 - Average daily sales, equations
- Inventory turnover:
 - Cost of goods sold, average inventory
 - Amount of sales, average inventory

Business Mathematics cont.

► RED indicates NEW MATERIAL

Managing Your Business cont.

- Break-even point:
 - Fixed costs, variable costs
 - Graph analysis
 - Parallel lines, intersecting lines, coordinate plane
 - Review of mathematical order of operation
 - Formula
- Trade discount: list price, net price, percentage
- Trade credit: percent of discount, discount period, credit period, E. O. M
- Storage and Inventory:
 - Volume, congruent
 - Cube, edges, rectangular solid, cylinder, cone
 - Conversion factors:
 - Time, English linear, liquid, dry, weight, metric
 - Metric-English
- Practical exercise application problems
- Word problems
- General principles
- Unit review

Investment

- Reading the stock exchange table
- Principal, dividends:
 - Fraction, denominator, numerator, mixed number
 - Greatest common factor, prime number, composite number
 - Least common denominator, improper fraction
 - Absolute value, cancellation, reciprocal
- Stock market
- Buying and selling stock:
 - Stock certificate
 - Stockbrokers
 - Stock exchange, New York Stock Exchange
 - Market value
 - Mixed decimal, whole number, decimal, terminating decimal, repeating decimal
 - Capital gain, capital loss
- Practical exercise application problems
- Stock market game: log sheets, money market fund
- Certificate of deposit (CD): simple interest formula, percents
- Savings account:
 - FDIC
 - Finding the principal: ending-balance method, minimum-balance method, daily-interest method
- Real estate: things to be aware of, rate of income, annual net income, cash investment
- Corporate bonds:
 - Bondholder, face value, par value, premium, discount, quoted price
 - Annual yield, annual interest, selling price
- Mutual funds: investment portfolio, prospectus
- Compound interest

- Real return on an investment:
 - Inflation, taxes
 - Expected gross return, expected after-tax return, expected real return
- Word problems
- General principles
- Unit review

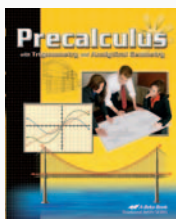
Income Taxes

- Earning a living:
 - Education, years with a business, responsibility
 - Salary, hourly, commission, piecework, tip, overtime, regular pay, bonus
- Deductions:
 - Gross pay, net pay
 - FICA, social security tax
 - Maximum taxable income
 - Inflation
- Income tax return: 1040EZ, employee's withholding, allowance certificate, W-4 form, dependents, W-2 form, 1040A, 1040, tax audit
- State income taxes: sample rate table
- Sales tax
- Property tax:
 - Assessed value, property tax rate, market value, assessed value
 - As a percent, amount per \$100, per \$1,000, in mills
- Corporate income tax: corporation, taxable income, annual gross income, deductions, graduated tax
- Practical exercise application problems
- Word problems
- General principles
- Unit review

Banking

- Checking records:
 - Balance, deposit slip, currency, transit number
 - Finding percent of increase or decrease
- Checks and register:
 - Steps for writing a check
 - Bouncing a check, poor credit risk
 - Bank statement
 - RC, OD
 - Canceled check, outstanding check
 - Outstanding deposit, reconcile
- Electronic banking: electronic funds transfer, automatic teller, PIN, debit card
- Loans to small businesses:
 - Single-payment loans, term, maturity value
 - Discount loan, proceeds, installment loan, amount financed
- Practical exercise application problems
- Word problems
- General principles
- Unit review

Precalculus Grade 12



The purpose of *Precalculus* is to teach the student how to select and apply various techniques to solve mathematical problems in a skillful, systematic, and logical manner. Students will learn the underlying principles of trigonometry and interrelationships of lines and functions with graphical and analytical problem-solving techniques from a study in analytical geometry. The study culminates with an introduction to selected calculus topics.

Topical Interest Essays

- The History of Pi
- Distance of travel due to earth's rotation
- Mathematics in Astronomy—Eratosthenes' calculation of earth's circumference
- Sir Isaac Newton
- Oscilloscope Measurement of Household Voltage
- Mathematics in Engineering
- The Place of Imaginary Numbers
- Euler's Formula $e^i + 1 = 0$
- Missile Guidance Technology
- Mathematics in Physics—Projectile Motion
- Mathematics in Biology
- Summation—A Calculation of Pi
- The Design of Cylindrical Containers
- Mathematics in Physics—Fluid pressure on a vertical surface

Evaluation

- Quizzes (49)
- Tests (9)
- 9-weeks exam (2)
- Semester exam
- Final exam

➤ **RED** indicates **NEW MATERIAL**

Trigonometry & Analytical Trigonometry

- Basic trigonometric ratios
- Solving right triangles
- Advanced trigonometric ratios
- Trigonometric functions
- Solving trigonometric equations
- Trigonometric graphs:
 - Intercepts
 - Symmetry, sinusoid
 - Amplitude, period, key angles, key points
 - Vertical and horizontal scaling
 - Vertical and horizontal translation
 - Phase shift
 - Vertical asymptotes
- Signs of the functions by quadrant
- Periodic motion: simple harmonic motion, frequency, rotating object, suspended object
- Identities:
 - Reciprocal, cofunction, Pythagorean, quotient
 - Negative angle, double angle, half angle
 - Sum and difference, product to sum, sum to product
 - Verifying
 - Used to find unknown values
- Special angle function values (30° , 45° , etc.; $\frac{\pi}{6}$, $\frac{\pi}{4}$, etc.)
- Inverse function values using a calculator
- Function values:
 - Angles in degrees
 - Angles in radians
 - Finding unknown function values
 - Function values using the unit circle, line diagrams of function values
 - Using a calculator, using right triangles, using special triangles:
 - 30° - 60° - 90°
 - 45° - 45° - 90°
 - 90° ; $\frac{\pi}{6}$ - $\frac{\pi}{3}$ - $\frac{\pi}{2}$, $\frac{\pi}{4}$ - $\frac{\pi}{4}$ - $\frac{\pi}{2}$

- Reducing trigonometric function angles: reference angle, reference triangle
- Rewriting as a cofunction

Coordinate Geometry

- Basic review, terminology
- Trigonometric Function graphs:
 - Intercepts, symmetry, sinusoid
 - Amplitude, period, key angles, key points
 - Vertical and horizontal scaling
 - Vertical and horizontal translation, phase shift
 - Vertical asymptotes
- Angles in degrees and radians
- Graphing by addition of ordinates
- Inverse functions, inverse trigonometric functions
- Intercepts: x-intercept, y-intercept
- Symmetry: x-axis, y-axis, origin
- Domain:
 - Limiting operations
 - Determining
- Complex number plane
- Points of intersection
- Distance
- Slope:
 - Variation, inclination
 - Parallel and perpendicular lines
 - Angle between two intersecting lines
- Straight line:
 - Inclination
 - Distance to a point
 - Systems of lines
 - Equation forms:
 - Slope-intercept
 - Point-slope, two-point, intercept, parallel to axes, general
- Midpoint

Precalculus cont.

► RED indicates NEW MATERIAL

Coordinate Geometry cont.

- Parametric equations:
 - Eliminating the parameter
 - Developing equations: Schrödinger's wave model graph
 - Involute of a circle, brachistochrone, cycloids
- Locus of a point
- Conic sections:
 - Circle: center, radius
 - Ellipse:
 - Vertices, foci, major and minor axes, latus rectum, eccentricity
 - Parabola:
 - Vertex
 - Focus, latus rectum, eccentricity
 - Hyperbola: vertices, foci, transverse and conjugate axes, latus rectum, eccentricity, asymptotes, conjugate hyperbolas
 - Horizontal and vertical translation, rotation of axes
- Graphing in three dimensions:
 - Traces, cylinders, elements
 - Graphs: ellipsoid, paraboloid, hyperboloid of one sheet, hyperboloid of two sheets, hyperbolic paraboloid, cone

Polar Coordinates

- Graphing techniques
- Terminology, conversions
- Analysis techniques: branch tangents at the pole, symmetry, determining angles resulting in undefined values
- Rotation of axes
- Graphs: lines, circles, roses, cardioids, limaçons, parabolas

Angles

- Angles on the Cartesian plane:
 - In degrees
 - In radians
- Initial side, terminal side, standard position
- Quadrant of an angle, coterminal angles, positive and negative angles: in degrees, in radians, conversions
- Bearing
- Key angles for a trigonometric function graph
- Trigonometric function values:
 - Reference angle by quadrant: in degrees, in radians
- Special angles: 30° , 45° , etc.; $\frac{\pi}{6}$, $\frac{\pi}{4}$, etc.

Functions

- Functional notation
- Domain and range:
 - Finding, using inequalities, using intervals, characteristics
- Functions: even, odd, periodic, inverse
- Horizontal line test, vertical line test, one-to-one functions

Triangles

- Solving right triangles
- Solving oblique triangles:
 - Law of sines, law of cosines
 - The ambiguous case

- Using angles of elevation and depression
- Finding area
- Right triangle trigonometry
- Reference triangle
- 30° - 60° - 90° , 45° - 45° - 90° ; $\frac{\pi}{6}$ - $\frac{\pi}{3}$ - $\frac{\pi}{2}$, $\frac{\pi}{4}$ - $\frac{\pi}{4}$ - $\frac{\pi}{2}$

Complex Numbers

- Imaginary numbers and basic quantities
- Standard form
- Graphing on the complex plane
- Magnitude, argument, trigonometric form, polar form, conversions
- Multiplying and dividing complex numbers
- Finding roots and powers: De Moivre's theorem

Distance

- Length of an arc:
 - Using degrees
 - Using radians
- Distance between two points:
 - In two dimensions
 - In three dimensions
 - Horizontal and vertical distance
 - From a line to a point

Vectors

- Scalar, equal vectors, unequal vectors, negative vector, resultant, vector sum

Regression Analysis

- Method of least squares: general equations for solution
- Close-fit curve
- Summation notation
- Pearson-r correlation coefficient
- Linear and non-linear data: $y = mx + b$, $y = ae^{bx}$, $y = ax^2$, $y = a + bx + cx^2 \dots + mx^n$

Introductory Calculus

- History, limits
- First derivative of a polynomial: using limits, using the short method
- Slope using derivatives
- Second derivative of a polynomial: maximum and minimum, critical points
- Rate of change:
 - Average
 - Instantaneous
- Velocity:
 - Average
 - Instantaneous
- Acceleration:
 - Average
 - Instantaneous
- Anti-derivative
- Area under a curve