

Basic Concepts List

for All Available Subjects



Math

Elementary Math	Mid-level Math	Algebra
Algebra II	Geometry	Trigonometry
Pre-Calculus	Calculus	Calculus BC
Discrete Math	Finite Math	Statistics
Intermediate Statistics	Linear Algebra	Quantitative Methods
Quantitative Reasoning		

Science

Elementary Science	Biology	Chemistry
Earth Science	Anatomy & Physiology	Organic Chemistry
Physics – Algebra Based	Physics – Calculus Based	Microbiology
Nursing		

Humanities

Social Studies	English	Essay Writing
College Essay Writing	Literature	Reading
Primary Reading	ESL	Primary ESL
Symbolic Logic		

Social Sciences

Introduction to Psychology	Research Methods	Introduction to Sociology
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Business

Introductory Accounting	Introductory Economics	Finance
Intermediate Accounting	Intermediate Economics	Business Law
Principles of Management		

Technology

MS Excel	MS Word	MS PowerPoint
Principles of Computer Sci.	C++	Java
Python	Web Design	Database Systems

Foreign Languages

French	German	Italian
Spanish		

Algebraic Skills

- Equations
- Functions
- Patterns

Geometry

- Composite and Real World Shapes
- Coordinates
- Lines and Angles
- Perimeter, Area, Volume
- Position and Direction
- Similar, Congruent, Symmetric Shapes
- Sorting and Classifying
- Three Dimensional Shapes
- Transformations
- Two Dimensional Shapes

Measurement

- Converting Units and Measurements
- Estimates
- Measuring
- Time
- Units and Tools

Numbers

- Coins, Bills, and Collections of Money
- Counting
- Decimals - Read, Write, Place Value, Compare
- Equivalent Numbers - Decimals and Fractions
- Fractions - Compare and Order
- Fractions - Read, Write, Model
- Integers
- Ordinal Numbers
- Whole Number - Place Value
- Whole Numbers - Compare and Order
- Whole Numbers - Read, Write, Characteristics

Operations and Number Relationships

- Decimals - Operations
- Estimation
- Fractions - Operations
- Number Properties
- Number Theory: Factors, Multiples, Primes, Divisibility
- Order of Operations
- Ratios, Rates, Proportions, Percents, Squares and Roots
- Solving Real World Problems with Operations
- Understanding Addition, Subtractions, Multiplication, and Division
- Whole Number Addition and Subtraction
- Whole Number Multiplication and Division

Statistics and Probability

- Collect and Organize Data
- Measures and Descriptions of Data
- Probability
- Read and Interpret Data

Algebra, Patterns and Relationships

- Algebraic Expressions
- Formulas
- Functions
- Graphing Relationships
- Inequalities
- Linear Relationships
- Number and Geometric Patterns
- Solving Equations
- Systems of Equations
- Variables and Substitution
- Represent and Analyze Quantitative Relationships between Dependent and Independent Variables
- Use Properties of Operations to Generate Equivalent Expressions
- Work with Radicals and Integer Exponents
- Understand the Connections between Proportional Relationships, Lines and Linear Equations
- Analyze and Solve Linear Equations and Pairs of Simultaneous Linear Equations
- Define, Evaluate and Compare Functions
- Use Functions to Model Relationships between Quantities

Data and Graphs

- Experiments and Data Collection
- Infer, Predict, Evaluate, Compare Data
- Measures of Central Tendency and Variation
- Represent, Read, Interpret Data Displays

Geometry

- Circles and Pi
- Classify Two- and Three-Dimensional Figures
- Coordinate Plane
- Drawing, Modeling, and Constructing Figures and Describe the Relationships between them
- Formulas for Perimeter, Area, Surface Area, Volume
- Logic and Reasoning
- Points, Lines, and Planes
- Properties of Two-Dimensional Figures
- Understand and Apply the Pythagorean Theorem
- Similarity, Congruence, and Symmetry
- Transformations

Measurement

- Estimate and Measure
- Measurement Systems
- Measurement Tools
- Rates, Indirect Measurements, Proportion

Numbers

- Compare and Order Numbers
- Equivalent Forms of Rational Numbers
- Estimation and Rounding
- Exponents and Roots
- Number Properties
- Number Theory Concepts
- Operations to Solve Problems
- Operations with Integers and Absolute Value

Operations with Real Numbers

Order of Operations

Percents

Ratios, Rates, Proportions

Understand Ratio Concepts and Use Ratio Reasoning to Solve Problems

Real Number System

Probability

Develop Understanding of Statistical Variability

Summarize and Describe Distributions

Sample Space, Combinations, Permutations

Theoretical and Experimental Probability

Use Random Sampling to Draw Inferences about a Population

Draw Informal Comparative Inferences about Two Populations

Investigate Chance Processes and Develop, Use, and Evaluate Probability Models

Understand Patterns of Association in Bivariate Data

Absolute Value Equations and Inequalities

- Graphing Absolute Value Equations and Inequalities
- Solving Absolute Value Equations and Inequalities

Algebraic Expressions

- Add, Subtract Expressions
- Multiply, Divide, Factor Expressions including Exponents
- Variables and Expressions

Linear Equations and Inequalities

- Slope, Intercepts, Points on a Line
- Solving Linear Equations
- Solving Linear Inequalities
- Solving Problems with Equations and Inequalities
- Systems of Equations and Inequalities
- Writing and Graphing Linear Equations
- Writing and Graphing Linear Inequalities

Numbers

- Exponents and Roots
- Number Properties
- Number Theory Concepts
- Operations with Real Numbers
- Ratios, Proportions, Percents and Rates

Patterns and Functions

- Composition and Operations on Functions
- Graphing Functions and Transformations
- Inverse of Function
- Patterns
- Properties of Functions - Domain and Range
- Properties of Functions - Zeros, End Behavior, Turning Points
- Relations and Functions
- Solving Problems with Functions
- Translate Between Forms

Probability

- Counting Principles and Sample Spaces
- Theoretical and Experimental Probability

Quadratic Equations, Inequalities, and Functions

- Factoring Quadratic Equations
- Graphing and Properties of Quadratic Equations
- Solving Quadratic Equations and Inequalities
- Systems of Nonlinear Equations and Inequalities

Radical, Exponential and Logarithmic Equations and Functions

- Graphing Exponential and Logarithmic Functions
- Properties of Exponents and Logarithms
- Radical Expressions, Equations and Rational Exponents
- Solving Exponential and Logarithmic Equations and Inequalities
- Solving Problems with Exponential and Logarithmic Functions

Statistics

- Data Analysis – Data Collection – Data Displays – Measures of Data

Geometry

[\(Back to Math\)](#)

Measurement

- Formulas and Measurement
- Indirect Measurements, Ratios, and Rates
- Units, Unit Conversions, and Error

Points, Lines, Angles, Planes

- Angle Relationships and Problems
- Coordinate Geometry - Slope, Distance, Midpoint
- Geometric Constructions

Proofs and Logic

- Conditional Statements
- Conjectures, Axioms, Theorems, Proofs
- Inductive and Deductive Reasoning

Two- and Three- Dimensional Shapes

- Congruency
- Relationship Between Plane and Solid Figures
- Right Triangles, Including Pythagorean Theorem
- Similarity
- Symmetry and Transformations
- Theorems and Problems with Circles
- Theorems and Problems with Polygons
- Theorems and Problems with Quadrilaterals
- Theorems and Problems with Triangles
- Three-Dimensional Figures
- Trigonometric Ratios in Right Triangles

Algebra II

[\(Back to Math\)](#)

Absolute Value Equations and Inequalities

Graphing Absolute Value Equations and Inequalities
Solving Absolute Value Equations and Inequalities

Conic Sections

Properties of Conic Sections
Solving Problems with Conic Sections

Linear Functions, Equations, and Inequalities

Slope, Intercepts, Points on a Line
Solving Linear Equations
Solving Linear Inequalities
Solving Problems with Equations and Inequalities
Systems of Equations and Inequalities
Writing and Graphing Linear Equations
Writing and Graphing Linear Inequalities

Matrices

Matrices Operations and Problems

Numbers

Complex Numbers
Number Properties
Operations with Real Numbers

Patterns and Functions

Composition and Operations on Functions
Graphing Functions and Transformations
Inverse of Function
Patterns
Properties of Functions - Domain and Range
Properties of Functions - Zeros, End Behavior, Turning Points
Relations and Functions
Solving Problems with Functions
Translate Between Forms

Polynomial, Rational Expressions, Equations and Functions

Solving and Graphing Polynomial Equations
Solving and Graphing Rational Equations

Probability

Counting Principles and Sample Spaces
Theoretical and Experimental Probability

Quadratic Equations, Inequalities, and Functions

Complex Solutions to Quadratic Equations
Factoring Quadratic Equations
Graphing and Properties of Quadratic Equations
Solving Quadratic Equations and Inequalities
Systems of Nonlinear Equations and Inequalities

Radical, Exponential and Logarithmic Equations and Functions

Graphing Exponential and Logarithmic Functions
Properties of Exponents and Logarithms
Radical Expressions, Equations and Rational Exponents
Solving Exponential and Logarithmic Equations and inequalities
Solving Problems with Exponential and Logarithmic Functions

Sequences and Series

Properties of Sequences and Series
Solving Problems with Sequences and Series

Statistics

Data Analysis
Data Collection
Data Displays
Measures of Data

Trigonometry

[\(Back to Math\)](#)

Complex Numbers

- Polar Coordinates, DeMoivre's Theorem
- Trigonometric Form
- z Complex Number

Introduction to Trigonometry: Linear Relationships and Functions

- Introduction to Trigonometry
- Introduction to Trigonometry: Linear Relationships and Functions
- Relations, Functions, and Graphs
- Defining and Finding Trigonometric Functions
- Slope, Linear Relations, Scatter Plots, and Piecewise Functions
- Introduction to Trigonometry: Linear Relationships and Functions Unit Review

Trigonometric Ratios

- Trigonometric Ratios
- Angles and Angle Measures
- Measuring angles using radian and degree measures
- Right Triangles and Trigonometric Ratios
- The Unit Circle
- Trigonometric Ratios Unit Review

Graphing Trigonometric Functions

- Introduction to Graphing Trigonometric Functions
- Graphing Trigonometric and Inverse Functions
- Inverse Trigonometric Functions
- Transformations of Trigonometric Functions
- Real-world Applications of Trigonometric Functions
- Vectors
- Graphing Trigonometric Functions Unit Review

Trigonometric Laws and Identities

- Trigonometric Laws and Identities
- Law of Sines and Law of Cosines
- Trigonometric Identities and Equations
- Area of Triangles
- Angular and Linear Velocities
- Trigonometric Laws and Identities Unit Review
- Modeling Periodic Phenomenon

Vectors

- Graphing and Operations with Vectors
- Solving problems with Vectors

Limits of functions (including one-sided limits)

- Calculate limits using algebra
- Estimating limits from graphs or tables
- Limits proofs for linear functions
- Vertical asymptotes and infinite limits
- Horizontal asymptotes and limits to infinity
- L'Hospital's Rule

Continuity

- Understanding continuity in terms of limits
- Types of discontinuity (infinite, jump, removable)
- Determining continuity from a graph or rule for a function
- Intermediate Value Theorem

Derivatives

- Compute derivatives of functions: power, exponential, logarithmic, trigonometric, inverse trig
- Apply Product Rule, Quotient Rule, Chain Rule, etc.
- Understand the first and second derivative graphically
- Approximate derivative from graph or tables
- Interpretation of the derivative as a rate of change (limit of an average rate of change)
- Relationship between differentiability and continuity
- Tangent line to curve
- Linear approximation and differentials
- Relationship between increasing and decreasing behavior and the sign of the derivative
- Mean Value Theorem
- Relationship between concavity and the sign of the second derivative
- Inflection Points
- Optimization Problems
- Related Rates Problems
- Implicit differentiation
- Antiderivatives and initial value problems
- Particle motion (position, velocity, acceleration)
- Slope fields and solution curves for differential equations

Integrals

- Riemann sums
- Basic properties of definite integrals
- Applications of integrals (including areas, arc length, volumes for solids of revolution)
- Fundamental Theorem of Calculus, Parts I and II
- Definite and indefinite integrals of basic functions
- Techniques of Integration (Substitution, Parts, Partial Fractions, Trigonometric Substitution)
- Improper Integrals
- Numerical Approximation of Integrals
- Separable differential equations

Parametric and Polar Curves

- Graphs, derivatives, areas, arc length

Series and Sequences

- Sequence convergence
- Partial Sums and the definition of series convergence
- Geometric Series and their sums
- Tests for series convergence
- Test for divergence (nth term test)
- Integral test and p-Series

Alternating series
Comparison test and limit comparison test
Ratio and Root Test
Power series, radius and interval of convergence
Maclaurin and Taylor series

In addition, the concepts below are frequently seen by students in pre-Calculus courses and ones that all Calculus tutors are expected to know and be able to assist students with:

Circle, ellipse, hyperbola, and parabola
Perform translations for various conic sections
Arithmetic and Geometric sequences
Trigonometric Ratios and Identities
Trigonometric graphs
Law of Cosines and Law of Sines
Functions and Graphs (Linear and Polynomial)
Exponential and Logarithmic Functions

Calculus Basics

- Combining Functions
- Patterns in Graphs

Limits and Continuity

- Finding Limits Analytically
- Asymptotes as Limits
- Relative Magnitudes for Limits
- When Limits Do and Don't Exist
- Continuity
- Intermediate and Extreme Value Theorems

Derivatives

- Slope and Change
- Derivatives at a Point
- The Derivative
- The Power Rule
- Sums, Differences, Products and Quotients
- Graphs of Functions and Derivatives
- Continuity and Differentiability
- Rolle's and Mean Value Theorems
- Higher Order Derivatives
- Concavity
- Chain Rule
- Implicit Differentiation

Rates of Change

- Extrema
- Optimization
- Tangent and Normal Lines
- Tangents to Polar Curves
- Tangent Line Approximation
- Rates and Derivatives
- Rectilinear Motion
- Motion with Vector Functions

Integrals

- Riemann Sums
- Area Approximations
- The Definite Integral
- Properties of Integrals
- Graphing Calculator Integration
- Application of Accumulated Change
- The Fundamental Theorem of Calculus
- Definite Integrals of Composite Functions
- Analyzing Functions and Integrals
- Area Between Curves
- Volumes of Revolution
- Cross Sections
- Arc Length

Inverse and Transcendental Functions

- Derivatives of Inverses
- Inverse Trigonometric Functions
- Logarithmic and Exponential Review

Transcendentals and $1/x$
Derivatives of Logarithms and Exponentials
L'Hopital's Rule
Analysis of Transcendental Curves
Integrating Transcendental Functions
Partial Fractions
Integration by Parts
Improper Integrals
Application of Transcendental Integrals
Derivatives of Parametric Functions
Integrating Parametric and Polar Functions

Separable Differential Equations and Slope Field

Slope Fields
Differential Equations and Models
Euler's Method
Exponential Growth
Application of Differential Equations

Sequences and Series

Sequences
Series
Convergence Tests
Radius of Convergence
Functions Defined by Power Series
Taylor and Maclaurin Series
Taylor's Theorem and Lagrange Error

Functions

- Know and use a definition of a function
- Write a function that describes a relationship between two quantities
- Perform algebraic operations on functions and apply transformations
- Write an expression for the composition of one given function with another and find the domain, range, and graph of the composite function
- Determine whether a function has an inverse and express the inverse, if it exist
- Know and interpret the function notation for inverses
- Identify and describe the discontinuities of a function and how these relate to the graph
- Understand the concept of limit of a function as x approaches a number or infinity
- Analyze a graph as it approaches an asymptote
- Computer limits of simple functions
- Explain how rates of change of functions in different families differ

Exponents and Logarithms

- Use the inverse relationship between exponential and logarithmic functions to solve equations and problems
- Graph logarithmic functions
- Graph translations and reflections of functions
- Compare the large-scale behavior of exponential and logarithmic functions with different bases and recognize that different growth rates are visible in the graphs of the functions
- Solve exponential and logarithmic equations
- Find an exponential or logarithmic function to model a given set of data or situation
- Solve problems involving exponential growth and decay

Quadratic Functions

- Solve quadratic type equations by substitution
- Apply quadratic functions and their graphs in the context of motion under gravity and simple optimization problems
- Find a quadratic function to model a given set of data or situation

Polynomials

- Given a polynomial function, find the intervals on which the function's values are positive and those where it is negative
- Solve polynomial equations and inequalities of degree of three or higher
- Graph polynomial functions given in factored form using zeros and their multiplicities, testing the sign on intervals and analyzing the function's large scale behavior
- The Remainder Theorem
- The Factor Theorem
- Fundamental Theorem of Algebra

Rational Functions and Difference Quotients

- Solve equations and inequalities involving rational functions
- Graph rational functions; identify asymptotes, analyzing their behavior for large x values and testing intervals
- Given vertical and horizontal asymptotes, find an expression for a rational function
- Know and apply the definition and geometric interpretation of difference quotient
- Simplify difference quotients
- Interpret difference quotients as rates of change and slopes of secants lines

Trigonometric Functions

- Define and graph and use all trigonometric functions of any angle
- Convert between radian and degree measure
- Calculate arc lengths in given circles
- Graph transformations of the sine and cosine functions
- Explain the relationship between constants in the formula and transformed graph

Know basic properties of the inverse trigonometric functions, including their domains and ranges. Recognize their graphs
Know the basic trigonometric identities for sine, cosine, and tangent
Pythagorean identities
Sum and difference formulas
Co-functions relationships
Double-angle and half angle formulas
Solve trigonometric equations using basic identities and inverse trigonometric functions
Prove and derive trigonometric identities
Find a sinusoidal function to model a given set of data or situation

Vectors, Matrices and Systems of Equations

Perform operations on vectors in the plane
Solve applied problems using vectors
Know and apply the algebraic and geometric definitions of the dot product of vectors
Know the definitions of matrix addition and multiplication
Add, subtract and multiply matrices
Multiply a vector by a matrix
Represent rotations of the plane as matrices and apply to find the equations of rotated conics
Define the inverse of a matrix and compute the inverse of two-by-two and three-by-three matrices
Compute determinants of two-by-two and three-by-three matrices
Write systems of two and three linear equations in matrix form
Solve systems using Gaussian elimination or inverse matrices
Represent and solve inequalities in two variables
Linear programming

Sequence, Series and Mathematical Induction

Know, explain and use sigma and factorial notation
Write an expression for the n th term
Write a particular term of a sequence when given the n th term
Understand, explain and use the formulas for the sums of finite arithmetic and geometric sequences
Compute the sums of infinite geometric series
Understand and apply the convergence criterion for geometric series
The principle of mathematical induction
Pascal's triangle
Binomial theorem

Polar Coordinates, Parameterizations, and Conic Sections

Convert between polar and rectangular coordinates
Graph functions given in polar coordinates
Write complex numbers in polar form
De Moivre's theorem
Evaluate parametric equations for given values of the parameter
Convert between parametric and rectangular forms of equations
Graph curves described by parametric equations
Use parametric equations in applied contexts to model situations
Identify parabolas, ellipses and hyperbolas from equations
Write the equation in standard form and graph parabolas, ellipses and hyperbolas
Derive the equation for a conic section from given geometric information
Identify key characteristics of a conic section from its equation or graph
Identify conic sections whose equations are in polar or parametric form

Modeling Mathematics

Construct a tangent from a point outside a given circle to a circle
Cavalieri's principle

Identify the shapes of two dimensional cross sections of three dimensional objects
Identify three dimensional objects generated by rotations of two-dimensional objects

Statistics

[\(Back to Math\)](#)

Analyze Data

- Confidence Intervals
- Correlation
- Expected Values and Probability Distributions
- Hypothesis Testing
- Infer and Predict
- Regression
- Sample Distributions and Central Limit Theorem

Collect Data

- Experiments and Data Collection
- Sampling

Probability

- Computing Probability
- Counting - Combinations and Permutations

Summarize Data

- Data Distribution
- Display Data
- Measures of Data
- Read, Interpret, Classify Data

Describing Data

- Numerical summary measures
- The effect of changing units on summary measures
- Tabular and graphical methods (dotplots, stemplots, boxplots)
- Comparing distributions (back to back stemplots, parallel boxplots)
- Comparing center and spread: within group, between group variation
- Comparing shapes
- Comparing outliers and other unusual features (clusters, gaps)

Probability

- Interpreting probability, including long run relative frequency interpretation
- "Law of Large Numbers" concept
- Addition rule, multiplication rule, conditional probability and independence
- Discrete random variables and their probability distributions, including binomial and geometric
- Mean (expected value) and standard deviation of a random variable
- Linear transformation of a random variable
- Combining independent random variables
- Notion of independence versus dependence
- Mean and standard deviation for sums and differences of independent random variables
- Simulation of random behavior and probability distributions

The Normal Distribution

- Properties of the normal distribution
- Using tables of the normal distribution
- The normal distribution as a model for measurements

Sampling and Experimentation: Planning and conducting a study

- Methods of data collection (census, sample survey, experiment, observational study)
- Planning and Conducting Surveys
- Characteristics of a well-designed and well-conducted survey
- Populations, samples, and random selection
- Sources of bias in sampling and surveys
- Sampling methods, including simple random sampling, stratified random sampling and cluster sampling
- Planning and Conducting Experiments
- Characteristics of a well-designed experiment
- Treatments, control groups, experimental units, random assignments and replication
- Sources of bias and confounding, including placebo effect and blinding
- Completely randomized design
- Randomized block design, including matched pairs design
- Generalizability of results and types of conclusions that can be drawn from observational studies, experiments and surveys

Sampling distribution

- Sampling distribution of a sample proportion
- Sampling distribution of a sample mean
- Central Limit Theorem
- Sampling distribution of a difference between two independent sample proportions
- Sampling distribution of a difference between two independent sample means
- Simulation of sampling distributions
- t distributions
- Chi-square distributions
- F distributions

Statistical Inference: Estimating population parameters and testing hypotheses

Estimation (point estimators and confidence intervals)
Estimating population parameters and margin of error
Properties of point estimators, including unbiasedness and variability
Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals
Confidence interval for a mean
Confidence interval for a proportion
Confidence interval for a difference between two means (unpaired and paired)
Confidence interval for a difference between two proportions
Confidence interval for a variance
Confidence interval for a ratio of two variances
Test of significance
Logic of significance testing, null and alternative hypotheses; p-values; one and two sided tests; interpret the results; concepts of Type 1 and Types 2 errors; concept of power
Test for a mean
Test for a proportion
Test for a difference between two means (unpaired and paired)
Test for a difference between two proportions
Test for a variance
Test for a ratio of two variances
Effect sizes

Anova

One-way ANOVA
Two-way ANOVA
Factorial – interactions
Randomized block ANOVA
Repeated Measures
Post-hoc analysis/multiple comparisons (Bonferroni, Tukey, LSD)

Exploring Categorical Data

Frequency tables and bar charts
Marginal and joint frequencies for two way tables
Conditional relative frequencies and association
Comparing distributions using bar charts
Chi-square test for goodness of fit, test for homogeneity, and test of independence (one and two-way tables)

Nonparametric tests (sign test, Wilcoxon rank sum test, Wicoxon signed rank test)

Regression and Correlation

Exploring bivariate data - analyzing patterns in scatter plots
Correlation and linearity
Simple linear regression - least-squares regression
Interpreting intercept and slope
Confidence interval for the slope of a least squares regression line
Test for the slope of a least squares regression line
Coefficient of determination
Residual plots, outliers and influential points
Transformations to achieve linearity: logarithmic and power transformations
Multiple regression
Test and confidence interval for parameters in a multiple regression model
Interpreting parameters in a multiple regression model

Determine the type of hypothesis test to use for different types of data

Solve linear equations and inequalities.
Graph linear equations in two variables.
Use mathematical modeling and linear regression to make predictions.
Solve function problems.
Quadratic Functions
Polynomial and Rational Functions
Solve exponential function problems.
Solve logarithmic function problems.
Solve simple interest problems.
Solve compound interest problems.
Solve problems involving future and present value of annuities. (sinking funds and amortization)
Solve systems of linear equations.
Gauss Jordan Elimination
Perform operations on matrices.
Inverse of a square matrix
Solve matrix equations.
Apply matrices in a real world scenario.
Inequalities in two variables
Systems of linear inequalities in two variables
Solve linear programming problems geometrically
Geometric Introduction to the Simplex Method
Maximization and Minimization with Mixed Problem Constraints
Basic Counting Principles
Permutations and Combinations
Sample Spaces, Events and Probability
Apply counting principles to solve problems.
Conditional Probability, Intersection and Independence
Solve probability problems.
Random Variables, Probability Distribution and Expected Value
Solve problems involving discrete probability.
Solve problems involving discrete probability.
Make decisions by computing the expected value of random variables.
Summarize and present data using graphs, measures of central tendency, and measures of dispersion.
Bernoulli Trials and Binomial Distribution
Normal Distributions
Solve linear programming problems geometrically.
Solve linear programming problems by the simplex method.
Solve problems involving Markov chains.
Properties of Markov Chains
Regular Markov Chains
Absorbing Markov Chains
Solve problems involving game theory.
Strictly Determined Games
Mixed Strategies Games
Linear Programming and 2×2 games - geometric approach
Linear programming and $m \times n$ games - simplex method and the dual

Discrete Math

[\(Back to Math\)](#)

- Apply basic enumeration techniques.
- Simplify assertions and compound statements in first-order logic.
- Apply basic set-theoretic concepts.
- Apply the principles of mathematical induction and recursion.
- Apply the basic concepts of computational complexity and algorithmic analysis.
- Solve problems of iteration.
- Manipulate relations and simple functions and their inverses.
- Use the properties of relations.
- Apply the properties of equivalence relations and partitions.
- Use the Principle of Inclusion and Exclusion.
- Identify graph isomorphism, planarity, connected components, and chromatic numbers.
- Identify properties of a tree.
- Apply properties of general graphs.
- Apply the basic concepts of Boolean algebra.
- Use the basic laws of Boolean algebra.
- Convert Boolean expressions into a disjunctive or conjunctive normal form.

Systems of Linear Equations

- Homogeneous and non-homogeneous systems
- Matrix representation of system
- Row reduction and echelon forms
- Gaussian and Gauss-Jordan elimination
- Consistent and inconsistent systems

Matrix Properties and Arithmetic

- Addition, Subtractions, Scalar Multiplication
- Matrix multiplication
- Transpose of a matrix
- Special Matrices - Identity, zero, diagonal, etc.
- Elementary matrices and elementary row operations
- Row equivalence

Determinants

- Determinant of 2×2 and 3×3 matrices
- Co-factor expansion
- Cramer's Rule
- Theorems involving determinants and invertibility
- Properties of determinants

Linear Transformations

- Properties of linear transformations
- Matrix representation of linear transformation
- Kernel
- Range
- Change of basis

Vector Spaces

- Linear dependence and independence
- Rank and nullity of a matrix
- Properties of vector spaces
- Subspaces
- Span of a vector space
- Basis of a vector space
- Properties of vectors and vector arithmetic

Eigenvalues and Eigenvectors

- Eigenvalues and Eigenvectors
- The Characteristic Equation

Matrix Decomposition

- LU decomposition
- QR decomposition
- Diagonalization
- Singular Value decomposition

Orthogonality/Least Squares

- Inner product spaces
- Orthogonality
- Orthonormal bases
- Gram-Schmidt orthonormalization
- Least squares regression

Applications and Limitations of Quantitative Analysis

- Business and Decision Analysis
- Arts and Social Sciences
- Medical and Health Sciences

Data and Terms

- Data Quality and measures
- Multivariate data
- F Statistic
- Coefficient Interpretation
- Data Sensitivity
- Hypothesis Testing

Decision Models

- Maxmin and Maximax
- Hurwicz
- Expected Value and Expected Value Perfect Information
- Decision Tree
- Equal Likelihood
- Highest Value vs Lowest Cost

Forecasting

- Linear Regression
- Non-Linear Regression
- Moving Average
- Exponential Smoothing
- Seasonal Index

Linear Algebra

- Vector
- Matrix
- Determinant
- Solving systems

Calculus

- Functions
- Derivatives
- Optimization

Advanced Statistical Modeling

- Chi Square
- Data Clustering
- ANOVA
- Simulation
- Probability Modeling

Quantitative Reasoning

[\(Back to Math\)](#)

Logic/Critical Thinking

- Truth Tables
- Simple Statements
- Venn Diagrams
- Compound Statements
- Analyzing Arguments

Arithmetic Knowledge

- Fractions
- Decimals and Rounding
- Scientific Notation, Powers of 10, and Approximations
- Rate, Ratio and Proportion
- Percentages
- Uses and Abuses of Percentages
- Index Numbers
- Unit Conversions
- Interpretation of Graphs

Geometry/Trigonometry

- Perimeters and Areas of Basic Geometric Shapes
- Measures of Distance and the Pythagorean Theorem
- Volume and Surface Area
- Basic Trigonometry
- Graphs of the Trigonometric Functions
- Applications of Trigonometry

Functions

- Definition and the Vertical Line Test
- One-to-one and Inverse Functions, the Horizontal Line Test
- Linear Functions (Standard and Slope-Intercept Forms of Equations)
- Applications of Linear Models
- Linear Inequalities
- Nonlinear Models (Exponential, Power, Logarithmic)
- Graphing Functions (Excel or TI-84/83)
- Solving systems of equations (Linear & Nonlinear)
- Linear Programming (Graphical Method)
- Linear Programming (Simplex Method)

The Mathematics of Finance

- Simple Interest
- Compound Interest (Lump Sums and Annuities)
- Applications of Compound Interest
- Amortization Schedules

Descriptive Statistics

- Measures of Central Tendency
- Measures of Spread/Dispersion/Variation
- Percentiles & Z-scores
- Graphing Tools Used to Summarize Data

Designing & Analyzing Studies

- Observational vs Experimental Studies
- Sampling Methods (Strengths and Weaknesses)
- Critical Evaluation of Statistical Studies

Probability Rules & Simulation

- Counting Methods - Multiplication Principle, Permutations, Combinations

Probability Concepts and Rules
Independent vs. Dependent Events
Joint vs. Disjoint (Mutually Exclusive) Events
Law of Large Numbers
Simulation Using TI-84/83 or MS Excel
Probability Distributions
Discrete vs Continuous Distributions
Normal Distribution
Random Variables and Probability Distributions
Expected Value & Risk Assessment
Binomial and Geometric Distributions, including Normal Approximation to the Binomial Distribution

Inference & Regression

Central Limit Theorem
Logic of Confidence Intervals
Logic of Hypothesis Testing
One Sample Inference About a Population Mean
One Sample Inference About a Population Proportion
Scatterplots & Correlation
Simple Linear Regression

Science – Elementary (Grades 4-6)

[\(Back to Science\)](#)

5 Senses
Animals
Astronomy
Atmosphere
Atoms
Basic Needs for Living Organisms
Calendar
Carbon Cycle
Cells
Classifying Living Things
Earthquakes
Earth's Resources
Earth's Surface
Ecosystem
Electricity
Energy
Energy Conservation
Environment
Food Chain/Web
Forces and Motion
Fossils
Genetics
Heat
Insect Life Cycle
Invertebrates
Investigation
Light
Light Energy
Magnets
Matter
Nitrogen Cycle
Organ Systems
Plants
Reproduction
Resources
Rock Cycle
Rocks
Seasons
Simple Machines
Soil
States of Matter
Tools
Vertebrates
Volcanoes
Water
Weather
Work

Science – Middle Grades (Grades 7-8)

[\(Back to Science\)](#)

- Astronomy
- Cell Structure and Function
- Earth
- Ecology
- Genetics
- Human Body
- Living Organisms
- Matter
- Metric system
- Motion
- Optics
- Periodic Table
- Scientific Method
- Scientific Tools

Earth Science

[\(Back to Science\)](#)

Math basics

- Algebra
- Dimensional analysis
- Metric system
- Scientific notation
- Significant digits

Nature of Science

- Accuracy and precision
- Bias and Ethics
- Communication
- Data collection and analysis
- Models
- Scientific Method
- Scientific Quantities
- Scientific Thinking
- Scientists and Discoveries
- Theories and Laws
- Tools and Measurement
- Graphical interpretations

Geology

- Time
 - Relative Time
 - Absolute Time
 - Divisions of Geologic Time
 - Origin of Earth
 - Evolution of life on Earth
- First Principle of Geology
- Principle of Uniform Process
- Law of Superposition
- Relative Age
- Unconformity
- Fossils
- Radioactive dating of rocks
- Plate Tectonics
 - Parts of the Earth – characteristics and classification
 - Chemical layers of the Earth
 - Physical layers of the Earth
 - Evidence and theories of Plate Tectonics
 - Alfred Wegener
 - Pangaea
 - Sea Floor Spreading
 - Tectonic Plates
 - Plate Boundaries
 - Subduction zones
 - Earthquakes
 - Richter Scale
 - Seismic Waves
 - Volcanoes
 - Ring of Fire
 - Hot Spots

- Landforms
- Paleomagnetism and Plate Dynamics
- Minerals
 - Elements
 - Mineral composition of Earth
 - Identification
 - Simple Identity Tests
 - Planetary composition and distribution
- Types of Rock and the Rock Cycle
- Chemical Cycles
 - Nitrogen – Oxygen – Carbon
- Erosion and Weathering
- Glaciers
- Soil
- Water
 - Water cycle
- Biomes
- Population
 - Growth rate
 - Food supply
- Pollution
 - Land – Water (sewage) – Air – Chemical -- Thermal
- Ecosystems
- Energy flow – Carbon cycle – Population Growth
- Natural Resources
 - Renewable/Non-renewable energy sources
 - Green House Effect
 - Acid Rain
 - Management
- Climate change
- Human impact/changes to planet
- Natural disasters – causes, effects, impact

Meteorology

- Air
 - Composition
 - Smog
 - Pressure
 - Temperature
 - Layers
 - Energy Absorption/reflection
 - Solar and Terrestrial Radiation
 - Convection currents
 - Moisture and Atmospheric stability
 - Wind – local and global
 - Convection Cell
 - Coriolis Effect
- Weather Conditions and how they are created
 - Humidity
 - Saturation
 - Relative Humidity and calculations
 - Dew Point
 - Fronts

- Jet Stream
- Global Weather
- Predication, forecast and measurement
- Tools for measuring weather conditions
- Weather map construction and interpretation
- Clouds
- Air Mass
- Climates

Oceanography

- Sea Floor Profile
- Parts of the Ocean
- Salinity
- Contributors to the water in the ocean
- Resources
- Coriolis Effect
- Major currents in the world and features
- Waves
- Tsunami characteristics

Astronomy

- Earth, Sun, and Moon System
 - Historical views of the solar system
 - Geocentric (Ptolemy)
 - Heliocentric (Copernicus)
 - Time Zones
 - Day Length
 - Seasons
 - Phases of the moon
 - Eclipses - Lunar and Solar
 - Tides
- Features of the Moon
- Theories of the creation of the moon
- Sun
 - Energy production - Fusion
 - Life cycle
 - Layers
 - Sunspots
 - Prominences – solar flares
 - Auroras
- Solar system
 - Structure and composition
 - Inner (Terrestrial) Planet characteristics and specifics
 - Outer (Jovian) planet characteristics and specifics
 - Motion
 - Kepler's Law
- Stars
 - Classifications
 - Life span/cycle
 - Creation of elements
 - Spectroscopy
 - H-R Diagram
 - Distances
- Galaxies

Distances
Amount
Types
Composition
Gravity
Formation of planets
Big Bang Theory and evidence
Space probes and exploration
Telescopes

Basic Chemistry

- Atoms
- Properties of Water Due to its Polarity and Hydrogen Bonding
- Molecular Movement, Osmosis and Diffusion
- Chemical Gradients
- Monomers and Polymers
- Carbohydrates, Lipids, Proteins, and Nucleic Acids

Cell Structure and Function

Structure and Function of the following:

- Cell Membrane, Cell Wall,
- Cytoplasm, Cytoskeleton, Centriole
- Nucleus, Nuclear Membrane, Nucleolus
- Golgi Apparatus, Endoplasmic Reticulum, Ribosome, Lysosome, Mitochondrion, Chloroplast
- Vacuole, Vesicle

Cellular Transport Across the Cell Membrane

Fluid Mosaic Model of the Cell Membrane and Semipermeability

Active Transport

Facilitated Diffusion

Passive Transport

Receptor Proteins

Signaling Molecules

Cell Energy & Related Processes

- Enzymes, Enzymatic Functions, and Enzymatic Pathways
- Autotrophs and Heterotrophs
- Glycolysis
- Kreb's Cycle
- Electron Transport Chain
- Fermentation
- ATP and Activation Energy
- Exergonic and Endergonic Reactions
- Light-Dependent Reactions of Photosynthesis
- Calvin Cycle
- Chemosynthesis

Cell Cycle

- Ploidy
- Mitosis/Meiosis
- G₀, G₁, S, G₂, and M Phases of the Cell Cycle
- Cell Cycle Checkpoints
- Oncogenes and Tumor Suppressors in relation to cell cycle: p53, MLH1, BRCA1/2 etc.

Basic Genetics

- Inheritance
- Mendel's Law of Heredity
- Monohybrid, Dihybrid, and Trihybrid Crosses
- Probability of Genotypes or Phenotypes based on Genetic Crosses
- Sex-linked Traits
- Pedigree Analysis
- Mitochondrial DNA

Molecular Genetics

- Famous genetic experiments-Hershey/Chase, Fred Griffith, Avery, Meselson/Stahl, Chargaff, and Watson/Crick.
- Semi-conservative replication

- Transcription
- Translation and Protein Processing
- Regulation of Gene Expression and Epigenetics
- Mutations and Chromosomal Abnormalities
- Genetic Engineering Techniques (PCR, Gel Electrophoresis, Restriction Enzymes, Cloning, and DNA Sequencing, and Gene Mapping) and Their Uses

Evolution & Phylogeny

- Common Ancestry
- Cell Theory and Characteristics of Life
- Theory of Endosymbiosis
- RNA World Hypothesis
- Natural Selection and Fitness
- Evidence Supporting Evolution (Fossil Record, DNA, Protein, Mathematical Models, etc.)
- Examples of Selective Pressures and Their Effects on Population
- Types of Selection
- The Role of Genetic Drift, Mutation, and Sexual Reproduction in Evolution
- Hardy-Weinberg Equilibrium
- Phylogenetic Trees & Cladograms
- Speciation & Extinction
- Taxonomy

Bacteria

- Characteristics
- Basic Structures Including:
 - Cell Wall, Cell Membrane, Ribosomes, Plasmids, Flagella
- Bacterial Conjugation
- Binary Fission

Viruses

- Characteristics
- Basic Structure Including:
 - Capsid/Coat Proteins
 - Genetic Material (including Reverse Transcriptase for RNA viruses)
- Relationship of Cell Receptors to Entrance of Viruses into Host cells
- Lytic and Lysogenic Stages of Virus Life Cycle
- Relationship of Viruses to Cancer
- Role of Mutation on the Evolution of Viruses

Animal Form & Function

- Body Plan Development
- Surface Area to Volume
- Origin and Function of the Following Cell Types
 - Epithelial
 - Connective
 - Muscle
 - Nervous
- Tissues, Organs and Organ Systems
- Homeostasis, Feedback Loops, and Hormones
- Animal Behavior
- Animal Reproduction
- Endotherms and Ectotherms
- Characteristics of the Following Phyla...
 - Protists, Porifera, Cnidaria, Nematoda, Mollusca, Annelida, Arthropoda, Echinodermata, Chordata

Plant Form & Function

- Evolution of Plants from Algae

Adaptations of Plants to Land

Vascular and Nonvascular Plants

Pollen, Seeds, Flowers, and Fruit

Plant Reproduction

Alternation of Generations

Plant Structures Including...

Leaf, Stomata, Cuticle

Xylem, Phloem

Rhizoids, Sporangium, Spores

Roots, Meristem, Sepal, Petal

Anther, Filament, Stamen, Stigma, Style, Ovary, Pistil, Fruit

Pollen, Seed, Flower

Angiosperms (including Monocots and Dicots) and Gymnosperms (including Conifers)

Response to Stimuli (hormones involved) Including

Auxins

Phototropism

Gravitropism

Fungi

Role In Decomposition

Reproduction

Fungal Structures Including...

Spores, Hyphae, Ascus, Stalk, Cap

Ecology

Biomes

Biodiversity

Ecosystem Energy Flow

Life History Strategies

Producers, Consumers, and Decomposers

Population Growth and Regulation

Biotic and Abiotic Factors Affecting Environments

All biogeochemical cycles including: Water, Carbon, Nitrogen, Sulfur, and Phosphorus Cycles

Interactions between species and types of symbiosis

General Science

Interpreting and Graphing Scientific Data

Interpreting and Summarizing Information from Literature

Development of Science Fair Projects

Assistance with Lab-related Assignments

Proofreading Reports for Science Content

Lab techniques

Microscopy

Serial dilution

Gel electrophoresis

Bacterial culturing

Anatomy & Physiology

[\(Back to Science\)](#)

Anatomical Terminology

Anatomical Regions, Cavities, Planes of Symmetry, and Directional Terms

General Chemistry

Protons, Neutrons, Electrons, Atoms, Elements, and Compounds

Bonding: Ionic, Covalent, and Hydrogen

pH scale, Acids and Bases

Organic and Inorganic Compounds

Macromolecules: Carbohydrates, Lipids, Proteins, and Nucleic Acids

Cellular Biology

Light and Electron Microscope Images and Uses

Cell Structure: Cell Membrane, Cytoplasm, Nucleus

Organelle Structure and Function

Protein Synthesis

Metabolism and Homeostasis

Mitosis and Meiosis

Histology

Structure, Function, Location, and Subtypes of Epithelial, Connective, Muscular, and Nervous Tissue

Embryology

Ectoderm, Mesoderm, and Endoderm and their derivatives

Organ Systems

Integumentary

Functions of the Integument

Layers composing the epidermis and dermis

Nutrient and Oxygen Supply to the epidermis and dermis

Subcutaneous layer

Accessory Organ Structure and Function: Hair, Nails, and Glands

Basic Knowledge skin cancer types and prognoses

Skeletal

Functions of the Skeletal System

Structure and Function of Cartilage

Bone Markings, Shapes, Matrix, Structures, and Names

Bone Cells Structure and Function: Osteocyte, Osteoclast, and Osteoblast

Differentiate between Compact & Spongy Bone

Differentiate between Endochondral and Intramembranous Ossification

Differentiate between Axial and Appendicular Skeleton

Basic knowledge of bone fractures and osteoporosis

Supporting Ligaments and discs

Types of Joints and their locations

Muscular

Functions of the Muscular System

Types and Locations of Muscular Tissue

Muscle Cell Structure and Function

Sliding Filament Theory & Excitation – Contraction Coupling

Sources of Energy for Muscle

Role of Exercise and Muscle Function

Knowledge of Names and Locations of muscles

Digestive

Structure and Function of Esophagus, Stomach, Small Intestines, Colon, Liver, Gall Bladder, Appendix and Rectum
Mechanical Digestion
Chemical Digestion
Absorption and transport of nutrients
pH balance and enzymatic function
Hormone regulation of digestive function and appetite
Extrinsic and Intrinsic Nervous function
Digestive Disease
Normal Flora of the gut

Nervous

Functions and Divisions of the Nervous System
Structure and Function of Neurons and Neuroglia
Generation and Propagation of an action potential
Synapses, Neurotransmitters, and Myelination
Brain Structure, Divisions, and Functions
Spinal Cord and Peripheral Nerve Structure and Function
Special Senses: Olfaction, Taste, Vision, Hearing, and Balance
Structure and Function of the Autonomic Nervous System

Endocrine

Second Messenger Pathways
Steroid production and function
Role of Hypothalamus
Structure & Function of Pituitary, Thyroid, Parathyroid, Adrenal, Pancreas, testes, Ovaries, and Pineal Glands
Hormones produced and their function

Cardiovascular

Functions and Composition of Blood
Clotting Cascade
Blood typing and diagnostic tests
Structure and Function of the heart
Electrical Activity of the Heart
Cardiac Cycle
Cardiac Output
Knowledge of Arteries and Veins that supply the body
Immunity & Lymphatic
Innate and Adaptive Immunity
Types and Functions of Immune Cells
Immunological Surveillance and Tolerance
Acquired Immunity
Structure and Function of Lymph Nodes, Spleen, Lymphoid Tissue, and Peyer's Patches
Lymphatic Circulation

Respiratory

Functions of the Respiratory System
Anatomy and Histology of the Respiratory Tract and Lungs
Properties of Ventilation and Pulmonary Function Tests
Oxygen and Carbon Dioxide exchange and circulation

Urinary

Structure and Function of the Kidney
Glomerular Filtration and Tubular Section & Reabsorption
Renin-Angiotensin Aldosterone Pathway
Function of Vasopressin (ADH) and Atrial Natriuretic Peptide

Structure and Function of the Ureter, Bladder, and Urethra

Reproductive

Meiosis and Gamete Production

Structure and Function of the Male & Female Reproductive System

Fertilization and Pregnancy

Math basics

Algebra – Dimensional analysis – Metric system – Scientific notation – Significant digits

Nature of Science

Accuracy and precision
Bias and Ethics
Communication
Data collection and analysis
Models
Pseudo Sciences
Safety
Science and Society
Scientific Method
Scientific Quantities
Scientific Thinking
Scientists and Discoveries
Theories and Laws
Tools and Measurement
Graphical interpretations
Basic laboratory equipment identification

Atoms, Molecules, and Compounds

Matter
Atoms
Molecules
Compounds
Mixture
Homogeneous and Heterogeneous
Chemical and Physical Properties
Symbols
Ions
Polyatomic ions
Isotopes
Elements
Atomic Mass
Atomic Number
Mass Number
Periodic Table
Law of Definite Proportions
Creating compound based on their charges
Mole Concept
Molar Mass
Determining of a formula of a compound ionic and covalent
Nomenclature for ionic and covalent compounds including the rules for transition metals
Hydrates
Atmospheric Chemistry

Using Chemical Equations in Calculations

Density
Avogadro's number
Conversions between atoms, molecules, moles, and masses
Percent composition
Balancing Chemical Equations

Classification of Reactions

Single Displacement (replacement) – Double displacement (replacement) – Decomposition – Synthesis (composition) – Combustion

Stoichiometry

Empirical formula

Molecular formula

Limiting Reagent

Gas Laws and Kinetic Theory

Kinetic-Molecular Theory

Pressure and equivalent units (ex. atm, psi, kPa, Pa, etc)

Volume and equivalent units (ex. mmHg, Torr, etc)

Temperature and equivalent units

STP

Maxwell-Boltzman Distribution

Graham's Law

Diffusion

Effusion

Boyle's Law

Charles' Law

Guy-Lussac's Law

Combined gas Law

Ideal Gas Law

Determine density and molar mass from ideal gas law

Dalton's Law

Collecting gas over water and partial pressures

Avogadro's Principle

Gas Mixtures and Partial Pressure

Kinetic Molecular Theory

Non-ideal Gases

Atomic and Molecular Structure

Atomic Theories

Atomic Structure

Octet Rule

Electron Configurations

Lewis Dot Structure

Periodic Trends

Ionization energies

Electron Affinity

Electronegativity

Ionic Size

Atomic Size

Reactivity

Chemical Bonding

Ionic – Covalent – Hydrogen – Metallic

Valence electrons

Orbitals

Orbital Geometry

Molecular Geometry

VSEPR theory

Quantum Theory

Polarity

Dipole moment

Hybridization
Sigma bond
Pi Bond
Resonance structures

Solids

Crystalline Solids
Bragg's Law
Unit cell
 Simple – Face centered – Body centered – End-centered

Liquids and Changes of State

Compressibility
Surface tension
Transition states
 Evaporation
 Evaporation
 Condensation
 Boiling
 Freezing
 Melting
 Fusion
 Sublimation
 Triple point
 Critical temperature
 Critical pressure
States of Matter
 Solids – Non-Newtonians – Liquids – Gases – Plasma
Phase Diagram
Kinetic Molecular Theory of Liquids

Physical Chemistry

Colligative Properties of Solutions
Enthalpy
Hess's Law

Aqueous Solutions

Solution
Solvent
Solute
Saturated
Unsaturated
Supersaturated
Dilute
Molarity
Molality
Normality
Mole Fraction (X)
Weight percent (wt%)
Parts per million (ppm)

Acids, Bases and Salts

Acid
Base
Salt
Anion and Cation

Electrolyte
Non-electrolyte
Indicators
Neutralization
Dissociation
Conjugate acid
Conjugate base
Strong acids and bases
Weak acids and bases
Monoprotic
Polyprotic
Bronsted-Lowry Acid/Base
Lewis Acid/Base
pH and pOH
Hydrolysis

Kinetics

Chemical Reaction Rates
Rate Expressions
Reaction Mechanisms
Activation Energy

Chemical Equilibria

Le Chatelier Principle
The Equilibrium Constant
Equilibrium Calculations
Factors Affecting Equilibria
ICE Tables

Ionic Equilibrium: Acids and Bases

Lewis Concept
Strong Acids and Bases
Weak Acids and Bases
pKa and pKb
Hydrolysis

Aqueous Equilibria

Common Ion Effect and Buffer Solutions
Henderson-Hasselbach Equation
Titration
End Point
Equivalence point
Acid-Base Titration Curves
Acid-Base Indicators
The Solubility Product Ksp
Solubility and the Common Ion Effect
Solubility and Complex Ions

ReDox

Reduction – Oxidation – Oxidizing agent – Reducing agent – Oxidation numbers – Half reactions – Activity series

Chemical Thermodynamics

Heat of formation/reactions
Enthalpy
Spontaneity, Disorder and Entropy

- Exothermic and Endothermic
- Differentiate between heat and temperature
- Calories vs calories
- Specific heat capacity
- Various temperature scales (Fahrenheit, Celsius, and Kelvin)
- Entropy and the Second Law
- Gibbs Free Energy
- Equilibrium Constants

Electrochemistry

- Electrochemical Cells and Potentials
- Voltaic Cells at Nonstandard Conditions
- Electrolytic Cells
- Faraday's Law

Nuclear Chemistry

- Types of radiation
 - Alpha – Beta – Gamma
- Radioactive Decay
- Fission and Fusion
- Nuclear equations
- Half-life
- Isotopes
- Bohr equations
- Rydberg equation
- Energy relationship to wavelength, frequency and period
- Heisenberg Uncertainty Principle
- Electromagnetic Radiation
- Sources of energy

Basic Organic Chemistry

- Carbon groups
- Polymers
- Names and chemical composition of functional groups
- Basic nomenclature of organic compounds
- Alkanes – Alkenes – Alkynes
- Saturated
- Unsaturated
- Cyclic hydrocarbons
- Aromatic Hydrocarbons

Biochemistry

- Proteins – Carbohydrates – Nucleic acids

Lab techniques

- Synthesis of compounds (solid and gas)
- Separation techniques
 - Precipitation
 - Filtration
 - Centrifugation
 - Distillation
 - Chromatography
- Titration using indicators and meters
- Spectrophotometry/calorimetry
- Gravimetric Analysis

Structure & Bonding

- Electron Configurations of Atoms
- Chemical Bonding & Valence
- Charge Distribution in Molecules
- The Shape of Molecules
- Isomers
- Analysis of Molecular Formulas
- Resonance
- Atomic and Molecular Orbitals

Intermolecular Forces

- Boiling & Melting Points
- Hydrogen Bonding
- Crystalline Solids
- Water Solubility

Functional Groups – Properties, Nomenclature, Synthesis, & Reactions of...

- Alkanes
- Alkenes
- Alkynes
- Alkyl halides
- Alcohols
- Aromatics
- Ketones
- Ethers
- Esters
- Carboxylic acids
- Amides
- Amines

Acids & Bases

- Arrhenius acids and bases
- Lowry-Brønsted Acids & Bases
- Lewis Acids and Bases
- Acid dissociation constants and pH
- Effect on acidity by...
 - Structure
 - Electronegativity effects
 - Hybridization effects
 - Resonance effects
 - Inductive effects

Stereochemistry

- Isomers
 - Constitutional isomers
 - Stereoisomers
 - Chiral and achiral
 - Enantiomers
 - Optical activity
 - R and S configurations
 - Diastereomers
 - Fischer projections
 - Meso compounds

Nucleophilic Substitution, Elimination, and Addition reactions

Biochemicals – Structure & Function of...

Carbohydrates

Lipids

Amino acids

Proteins

Enzymes

Vitamins

Lab techniques

Synthesis of compounds (solid and gas)

Separation techniques

Precipitation

Filtration

Centrifugation

Distillation

Chromatography

Solubility

Melting point determination

Nuclear Magnetic Resonance (NMR) spectrometer operation and analysis

Infrared (IR) spectrometer operation and analysis

Gas chromatography and Mass Spectrometry (GC-MS) analysis

Physics – Algebra-based

[\(Back to Science\)](#)

Math basics

- Algebra and Trigonometry
- Dimensional analysis
- Metric system
- Scientific notation
- Significant digits
- Vectors and scalars
 - Addition using graphical methods
 - Addition using algebraic methods
 - Components of vectors
 - Equilibrants

Nature of Science

- Accuracy and precision
- Bias and Ethics
- Communication
- Data collection and analysis
- Models
- Pseudo Sciences
- Safety
- Science and Society
- Scientific Method
- Scientific Quantities
- Scientific Thinking
- Scientists and Discoveries
- Theories and Laws
- Tools and Measurement

Kinematics

- Position, Distance, and Displacement
- Speed and velocity
- Acceleration
- Position vs time graphs
- Velocity vs time graphs
- Kinetic equations under constant acceleration
- Free fall equations
- Projectiles
- Circular motion
- Center of mass

Dynamics

- Newton's Laws
 - Static equilibrium (1st Law)
 - Translational equilibrium
 - Rotational equilibrium (torque)
 - Free Body Diagram
 - Dynamics of a single body (2nd law) -- Force
 - Systems of two or more bodies (3rd law)
 - Weight and weightless
 - Universal Gravitation
 - Gravitational Fields
 - Orbits
 - Kepler's Laws of Planetary Motion

- Static and kinetic friction
- Air resistance
- Elevator problems
- Incline planes
- Atwood Machines
- Circular motion and rotation
 - Uniform circular motion
 - Circular speed
 - Centripetal Force
 - Frequency and Period
 - Vertical Circular motion
 - Rotational Kinematics
 - Moment of inertia
 - Rotational Kinetic Energy

Work, energy and power

- Work and work-kinetic energy theorem
- Conservative forces and Potential energy
 - Gravity – Springs
- Conservation of mechanical energy
- Power
- Simple Harmonic motion
 - Springs and Hooke's Law
 - Pendulums
 - Energies of SHM
 - Graphs of SHM
 - Spring-mass system
- Momentum
 - Momentum definition
 - Impulse
 - Impulse-Momentum Theorem
 - Non-constant force
 - Conservation of linear momentum and collisions
 - Inelastic and elastic collisions
 - Two dimensional collisions
 - Angular momentum
 - Conservation of angular momentum
- Sources of energy on Earth

Fluid Mechanics

- Density and Pressure
 - Density
 - Specific gravity
 - Pressure as a function of depth
 - Pascal's Law
- Buoyancy – Archimedes' Principle
- Fluid dynamics
- Fluid Flow continuity equation
- Bernoulli's Equation
- Hydrostatics
- Fluid Pressure

Thermal Physics

- Heat

- Temperature
- Mechanical Equivalent of heat
- Heat Transfer and thermal expansion
 - Linear expansion of solids
 - Volume expansion of solids and liquids
- Calorimetry
- Kinetic Theory
- Ideal Gases
- Gas laws
- Thermodynamics
 - Processes and PV diagrams
 - Isothermal – Isobaric – Isometric -- Adiabatic – Cyclic
 - Zeroth law of Thermodynamics
 - First law of Thermodynamics
 - Internal energy – Energy conservation – Molar heat capacity of a gas
 - Second law of Thermodynamics
 - Directions and processes
 - Entropy
 - Third Law of Thermodynamics
 - Heat engines and Carnot engines
 - Refrigerators
 - Rms speed of gas molecules
 - Avogadro's number and Boltzmann's constant

Electrostatics

- Electric charges
- Conductors, insulators and semi-conductors
- Charging by conduction
- Charging by induction
- Coulomb's Law
- Electric fields
- Gauss' Law
- Electric Potential Energy and Electric Potential
- Motion of charges particles in electric fields
- Capacitance
 - Graphical description of capacitance (charge vs. voltage)
 - Slope – capacitance
 - Area – energy storage
 - Capacitors in series and parallel
 - Point charge distribution
 - Parallel plates
 - Cathode Ray tubes
 - Millikan Oil Drop Experiment
 - Condensers

Current Electricity

- EMF
- Circuits
- AC/DC
- Current
- Resistance
- Electric Power
- Electric Energy
- Resistors in series

Resistors in Parallel
Batteries and Internal Resistance
Kirkoff's Law
Ohm's Law
Voltmeters
Ammeters
RC circuits

Electromagnetism

Force of a magnetic field on a moving charge
Force of a magnetic field on a current carrying wire
Torque on a current carrying loop
Magnetic fields due to straight and coiled wires
Electromagnetic Induction
Magnetic flux
Faraday's Law
Lenz's Law
Motors
Mass Spectrometers
Generators

Wave Motion and Sound

Description and characteristics of waves
Types of waves
Standing waves
Beats
Harmonics
Wave on a string
Wave in a tube
Doppler Effect
Sound intensity
Sound Power
Relative sound intensity

Optics

Reflection
Law of reflection
Refraction
Snell's Law
Total Internal reflection
Critical angle
Images formed by plane mirrors
Images formed by spherical mirrors
Images formed by parabolic mirrors
Images formed by lenses
Ray-diagrams
Thin lens
Mirror equation
Image formation by a two-lens system
Interference
 Superposition Principle
 Double slit interference
 Thin Film
 Newton's Ring

- Non-reflective coating for glass
- Diffraction
 - Single slit
 - Superposition of double slit
 - Diffraction gratings
 - Interference and Diffraction patterns
- Polarization
- The electromagnetic spectrum
- Inverse square law

Modern Physics

- Atomic Physics and Quantum Effects
 - Photons and photoelectric effect
 - Energy and linear momentum of photons
 - X-ray production
 - Electron energy levels
 - Ionization energy
 - Emission spectrum
 - Absorption spectrum
 - Lasers
 - Continual spectrum
 - Compton Effect
 - Wave nature of matter
 - DeBroglie equation
 - DeBroglie Hypothesis: Davisson-Germer experiment

Nuclear Physics

- Atomic mass
- Mass number
- Atomic number
- Mass defect and binding energy
- Nuclear processes
 - Modes of radioactive decay (alpha, beta, gamma)
 - Fission
 - Fusion
- Mass-energy equivalence
- Conservation of energy-mass
- Nuclear symbols
- Nuclear reactions
- Neutrino
- Chain reactions
- Isotopes
- States of matter
- Atomic Models

Physics – Calculus-based

[\(Back to Science\)](#)

This subject covers the material from AP Physics C-Mechanics, AP Physics C-Electricity and Magnetism, and introductory college level physics courses that require calculus as a prerequisite.

Math Basics

- Algebra, trigonometry and calculus
- Dimensional analysis
- Units and unit conversions
 - The metric system
- Scientific notation
- Estimates and orders of magnitudes
- Significant figures
- Vectors and scalars
 - Addition using graphical methods
 - Addition using algebraic methods
 - Components of vectors
 - Unit vectors
 - Equilibrants
- Cross product
- Dot product
- Derivatives
- Integrals

Nature of Science

- Accuracy and precision
- Data collection via observation and measurement and the analysis of this data
- Error analysis
- Experimental design
- Models
- Scientific method
- Tools and measurement
- Communicating scientific results

Newtonian Mechanics

Kinematics (Motion Along a Straight Line)

- Position, distance, and displacement
- Average and instantaneous velocity
 - Difference between velocity and speed
- Average and instantaneous acceleration
- Position vs time graphs
- Velocity vs time graphs
- Acceleration vs time graphs
- Differential determination of position, velocity and acceleration as a function of time
- Kinematic equations under constant acceleration

Dynamics

- Newton's Laws of Motion
 - Static equilibrium (1st Law)
 - Translational equilibrium
 - Free Body Diagram
 - Dynamics of a single body (2nd law) – Force
 - Write differential equation for velocity as a function of time
 - Method of separation of variables to derive the equation for velocity as a function of time
 - Expression of acceleration as a function of time while under the influence of drag
 - Systems of two or more bodies (3rd law)

- Mass and weight
- Fundamental forces of nature
- Static and kinetic friction
- Air resistance
- Elevator problems
- Incline planes
- Atwood Machines
- Dynamics of circular motion

 - Centripetal force

Work, energy and power

- Work and the work-kinetic energy theorem
- Integrate to calculate the work performed by a varying force
- Conservative forces and potential energy
 - Gravitational potential energy
 - Elastic potential energy (springs)
- Non-conservative forces
- Conservation of mechanical energy
- Energy diagrams
- Power

Systems of particles, linear momentum, impulse and collisions

- Center of mass
 - Symmetrical object
- Two object system
 - Integration to determine for a thin rod of non-uniform density
 - Linear momentum concerns
- Momentum
 - Momentum definition
 - Impulse
 - Impulse-Momentum Theorem
 - Non-constant force
 - Conservation of linear momentum and collisions
 - Inelastic and elastic collisions
 - Two dimensional collisions
 - Rocket Propulsion

Circular Motion and Rotations

- Uniform circular motion
- Angular velocity and acceleration
- Frequency and period
- Vertical circular motion
- Rotational kinematics
- Moment of inertia
- Rotational inertia
- Parallel axis theorem
- Rotational kinetic energy
- Work and power in rotational motion
- Torque
- Torque and angular acceleration for a rigid object
- Rotation of a rigid object around a fixed axis
 - Angular momentum
 - Conservation of angular momentum
 - Gyroscopes and precession

Equilibrium and Elasticity

- Rotational equilibrium (torque)
- Conditions for static equilibrium
- Center of gravity
- Stress, strain, and elastic moduli
- Elasticity

Fluid Mechanics

- Density and Pressure
 - Density
 - Specific gravity
 - Pressure as a function of depth
 - Pascal's Law
- Buoyancy – Archimedes' Principle
- Fluid dynamics
- Fluid Flow continuity equation
- Bernoulli's Equation
- Hydrostatics
- Fluid Pressure
- Viscosity and Turbulence

Gravitation

- Universal Gravitation
- Gravitational Fields
- Orbits
- Kepler's Laws of Planetary Motion
- The Motion of satellites
- Apparent Weight
- Oscillatory Motion
 - Springs and Hooke's Law
 - Pendulums
 - Energies of simple harmonic motion
 - Graphs of simple harmonic motion
 - Spring-mass system
 - Resonance and sinusoidal external force
 - Damped oscillations
 - Parallel combinations of identical or differing lengths of springs
 - Torsional pendulum

Thermal Physics

- Heat
- Temperature
- Mechanical Equivalent of heat
- Heat Transfer and thermal expansion
 - Linear expansion of solids
 - Volume expansion of solids and liquids
- Calorimetry
- Kinetic Theory
- Ideal Gases
- Gas laws
- Thermodynamics
 - Processes and PV diagrams
 - Isothermal
 - Isobaric
 - Isometric
 - Adiabatic

- Cyclic
- Zeroth law of Thermodynamics
- First law of Thermodynamics
 - Internal energy
 - Energy conservation
 - Molar heat capacity of a gas
- Second law of Thermodynamics
 - Directions and processes
 - Entropy
- Third Law of Thermodynamics
- Heat engines and Carnot engines
- Refrigerators
- Rms speed of gas molecules
- Avogadro's number and Boltzmann's constant

Electricity and Magnetism

Electrostatics

- Electric charges
- Conductors, insulators and semiconductors
- Charging by conduction
- Charging by induction
- Coulomb's Law
- Electric fields
- Electric Field Lines
- Electric Dipoles
- Electric Flux
- Gauss's Law
- Electric Potential Energy and Electric Potential
- Potentials of charge distributions

Conductors, Capacitors and Dielectrics

- Electrostatics with conductors
- Equipotential surfaces
- Capacitance
 - Graphical description of capacitance (charge vs. voltage)
 - Slope – capacitance
 - Area – energy storage
 - Capacitors in series and parallel
 - Point charge distribution
 - Parallel plates
 - Cathode Ray tubes
 - Millikan Oil Drop Experiment
 - Condensers
 - Voltage, charge and stored energy in a capacitor
 - Cylindrical vs. Spherical capacitors

- Dielectrics

Current and Resistance

- Current
- Resistivity
- Resistance

Direct Current Electric Circuits

- EMF
- Electric Power
- Electric Energy

- Resistors in series
- Resistors in Parallel
- Batteries and Internal Resistance
- Kirchhoff's Law
- Ohm's Law
- Voltmeters
- Ammeters
- RC circuits

Magnetic Fields

- Sources of magnetic fields
- Right-hand rule
- Left-hand rule
- Force of a magnetic field on a moving charge
- Force of a magnetic field on a current carrying wire
- Torque on a current carrying loop
- Magnetic fields due to straight and coiled wires
- Biot-Savart Law
- Ampère's Law

Electromagnetism

- Motion of charged particles in electric and magnetic fields
- Electromagnetic induction
- Magnetic flux
- Inductance
- RL circuits
- LC circuits
- LRC circuits
- Faraday's Law
- Lenz's Law
- Alternating current circuits
 - Phasors and alternating currents
 - RMS voltages and currents
 - Resistance and reactance
 - AC LRC circuits
 - Power in AC circuits
 - Resonance in AC circuits
- Displacement current
- Maxwell's equations
- Motors
- Mass spectrometers
- Generators
- Transformer

Wave, Motion, and Sound

- Description and characteristics of waves
- Types of waves
- Standing waves
- Beats
- Harmonics
- Wave on a string
- Wave in a tube
- Doppler Effect
- Sound intensity

Sound Power
Relative sound intensity

Optics

Nature and Propagation of Light

Reflection
Law of reflection
Refraction
Snell's Law
Total internal reflection
Critical angle
Geometric Optics
 Images formed by plane mirrors
 Images formed by spherical mirrors
 Images formed by parabolic mirrors
 Images formed by lenses
 Ray-diagrams (Geometric Optics)
 Thin lens
 Mirror equation
 Image formation by a two-lens system
Physical Optics
 Interference
 Superposition principle
 Double slit interference
 Thin film
 Newton's ring
 Non-reflective coating for glass
 Diffraction
 Single slit
 Superposition of double slit
 Diffraction gratings
 Interference and diffraction patterns
 Huygen's Principle
 Polarization
 The electromagnetic spectrum
 Inverse square law

Modern Physics

Quantum Mechanics and the nature of light
Relativity
 Frames of reference
 Time dilation
 Length Contraction
 Relativistic momentum
 Rest mass energy
Atomic physics and quantum effects
 Photons and photoelectric effect
 Energy and linear momentum of photons
 X-ray production
 Electron energy levels
 Ionization energy
 Emission spectrum
 Absorption spectrum
 Lasers

- Continuum spectrum
- Compton Effect
- Wave nature of matter
- DeBroglie equation
- DeBroglie Hypothesis: Davisson-Germer experiment
- Nuclear physics
 - Atomic mass
 - Mass number
 - Atomic number
 - Mass defect and binding energy
 - Nuclear processes
 - Modes of radioactive decay (alpha, beta, gamma)
 - Fission
 - Fusion
 - Mass-energy equivalence
 - Conservation of energy-mass
 - Nuclear symbols
 - Nuclear reactions
 - Neutrino
 - Chain reactions
 - Isotopes
 - States of matter
 - Atomic models

Microbiology

[\(Back to Science\)](#)

The microbiology course is considered an advanced science course. It is expected that tutors are knowledgeable in foundational biological, chemical and mathematical concepts as they underlie and relate to microbiology

Basic Biology

- Eukaryotes
- Prokaryotes
- Cellular division of eukaryotic and prokaryotic cells
- Functional anatomy of various cells
- Whitaker Five Kingdoms
- Woese Three Domain clarification

Microbial Traits

- Types
 - Bacteria
 - Algae
 - Fungi
 - Protists
 - Helminthes
 - Viruses
 - Viroids
 - Prions
 - Archaea
- Nutrition
- Growth
- Control in various environments
 - Acidic
 - Basic
 - High temperature
 - Low temperature
 - Saline
 - Nutrient rich and nutrient poor
- Structure
- Metabolism
- Pathways
- Catabolism
- Anabolism
- Gram positive bacteria anatomy
 - Low G + C gram positives
 - High G + C gram positives
- Gram negative bacteria anatomy
 - Deinococci
 - Nonproteobacteria
- Biochemistry processes
- Recombinant DNA technology
 - Vectors
 - PCR
 - Restriction enzymes
 - Gene cloning
- Taxonomy and classification (Bergey)

Cytology
Cellular physiology

Genetics

Structure
Replication
Expression
Mechanisms of variation
Mapping of distances in genes
Lac operon
Lac repressor
Trp operon
Arabinose operon
Genetic recombination
Transformation
Conjugation
Transduction

Ecology

Biogeochemical cycling
 Carbon cycle
 Nitrogen cycle
 Oxygen cycle
 Phosphorous cycle
 Sulfur cycle
 Water cycle
 Mercury cycle
 Atrazine cycle
Microorganisms in marine and freshwater ecosystems
Microorganisms in terrestrial ecosystems
Symbiosis
Mutualism
Commensalism
Parasitism

Pathogenicity

Germ Theory
Infection and reproduction
Host and parasite relationship
Infectious disease
Disease transmission
Nosocomial infections
Mechanisms of pathogenicity
Antimicrobial drugs
Important pathogens and diseases
 Respiratory system
 Cardiovascular system
 Lymphatic system
 Nervous system
 Gastrointestinal system
 Endocrine system
 Urinary and reproductive systems
 Integument system and eyes
 Immune system
Sterilization

Disinfection

Immunization

Innate host resistance

Adaptive Immunity

Sanitation

Hygiene

Health

Epidemiology

Antimicrobial chemotherapy

Microbiology of food

Industrial microbiology

Laboratory Techniques

Basic laboratory equipment identification

Guidelines for safe handling of microorganisms and infectious materials

Microscope use including oil emersion

Methods for taking clinical samples

Incubation techniques

Inoculation techniques

Isolation techniques

Identification techniques

Gram stain

ELISA

Chromatography

Spectrophotometry

Serial dilution technique and calculations

Nursing Medical Surgical Fundamentals

Tutors must be knowledgeable about the fundamentals of nursing including nursing roles, settings, health care trends, all body systems and their disorders, emergency and disaster management, and mental health nursing. In particular, tutors should be familiar with nursing care in all of the following areas:

- Role of the medical-surgical nurse
- Nursing practice and interventions
- Health and nursing assessments
- Diagnostic testing and evaluation
- Care of clients in the following areas:
 - Pain Management
 - Altered fluid electrolyte or acid-base balance
 - Trauma and shock
 - Pre- and post surgery
 - Infections
 - Altered immunity
 - Cancer
 - Loss, grief and death
 - Problems with substance abuse
- Maternal-Child Health (OB)
- Pediatrics
- Psychiatric Nursing

Nursing Care Plans

Tutors must be familiar with all aspects of the creation of nursing care plans including:

- Assessment
- Nursing diagnosis
- Outcomes and Interventions
- Creating the Nursing Care Plan
- Documentation
- Implementation of the Nursing Care Plan
- Evaluation of the Nursing Care Plan

Nursing Pathophysiology:

Tutors must be knowledgeable of the following **systems and associated disorders**:

- Cardiovascular system
- Circulatory system
- Renal system
- Respiratory system
- Nervous system
- Gastrointestinal system
- Endocrine system
- Reproductive system
- Musculoskeletal system
- Integumentary system
- Cell and body tissue physiology
- Fluid and electrolyte balances
- Genetic and hereditary disorders
- Inflammation, infection and immune response systems
- Oncological diseases

Otolaryngology

Ophthalmology

Nursing Pharmacology

Nursing process in drug therapy

Pharmacologic principles

Principles and practices of administration of medication

Drug calculations

Dosage calculations

Legal and ethical requirements in drug therapy

Life span of pharmaceuticals

Gene therapy and pharmacogenetics

Medication error response and prevention

Essential knowledge of the following drug types:

Analgesic drugs

General and local anesthetics

Depressants and muscle relaxants

Stimulants and related drugs

Antiepileptic drugs

Psychotherapeutic drugs

Antiparkinsonian drugs

Adrenergic drugs

Cholinergic drugs

Heart failure drugs

Antidysrhythmic drugs

Antianginal drugs

Antihypertensive drugs

Diuretic drugs

Coagulation modifier drugs

Antilipemic drugs

Pituitary drugs

Thyroid and antithyroid drugs

Adrenal drugs

Women's health drugs

Men's Health drugs

Antihistamines, decongestants and antitussives

Bronchodilators and other respiratory drugs

Antibiotics

Antiviral drugs

Antitubercular drugs

Antifungal drugs

Antimalarial, antiprotozoal, antihelmintic drugs

Anti-inflammatory and antigout drugs

Immunosuppressants

Immunizing drugs

Antineoplastic drugs

Biologic response drugs

Acid controlling drugs

Bowel disorder drugs

Antiemetic and antinausea drugs

Anemia drugs

Dermatologic drugs

Ophthalmic and otic drugs

Hormones that regulate calcium and bone metabolism
Drugs used in oncologic disorders
OTC drugs, herbal and dietary supplements

Social Studies

[\(Back to Humanities\)](#)

Elementary (Grades 4-6)

Africa
American Historical Figures
American Revolution
China
Citizenship
Civil Rights
Civil War
Colonial Settlements in America
Communities
East Asia and Pacific
Egypt
Elections
Europe
Family and Authority
French and Indian War
Geography
Government
Greece
Holidays and Diversity
India
Japan
Latin America
Louisiana Purchase
Mesopotamia
Middle East
Native American Culture
Religions of the World
Rome
Slavery in America
South and Southeast Asia
The Bill of Rights
The Constitution
The Declaration of Independence
The Incas
The Mayans
Trade
War of 1812
Westward Expansion
World Cultures

Social Studies

[\(Back to Humanities\)](#)

Middle Grades (Grades 7-8)

Africa
American Revolution
Articles of Confederation
Byzantine Empire
Central and South America
China
Civil Rights
Civil War
Colonial Settlements in America
Demographic Concepts
Early American government and political systems
Economics
European History
Exploration
French and Indian War
Geography
India
Japan
Louisiana Purchase
Mapping
Middle East
Monroe Doctrine
Native Americans
North America
Religions of the World
Slavery in America
The Bill of Rights
The Constitution
The Declaration of Independence
The Physical Environment
War of 1812
Westward Expansion

Social Studies

[\(Back to Humanities\)](#)

High School (Grades 9-12)

- Africa
- American Revolution
- Ancient Civilizations
- Articles of Confederation
- Asia
- Civil War
- Cold War
- Colonial Settlements in America
- Contemporary World Events
- Declaration of Independence
- Early American Government and Political Systems
- Economics
- European History
- Geography
- Gulf War
- Industrialism
- Korean War
- Latin America
- Louisiana Purchase
- Middle East
- Native Americans
- Prehistoric America
- Reconstruction
- Slavery in America
- Soviet Union and Eastern Europe
- The Bill of Rights
- The Constitution
- The Monroe Doctrine
- Vietnam War
- War of 1812
- Westward Expansion
- World War 1
- World War 2

English

Elementary (Grades 4-6)

[\(Back to Humanities\)](#)

Adjectives
Adverbs
Antonyms
Contractions
Fiction
Grammar
Letter Writing
Literary Analysis
Literary Device
Literary Themes
Non-Fiction
Nouns
Paragraphs
Parts of Speech
Phonemes
Plays and Theater
Poetry
Presentations
Pronouns
Punctuation and Capitalization
Reading Comprehension
Research Skills
Sentence Structure
Synonyms
Verbs
Vocabulary
Writing Sentences

English

Middle Grades (Grades 7-8)

[\(Back to Humanities\)](#)

- American Literature
- Characterization
- Grammar
- Literary Analysis
- Literary Criticism
- Literary Devices
- Literary Themes
- Narrative
- Plays and Theater
- Point of View
- Prose and Poetry
- Punctuation and Capitalization
- Reading Comprehension
- Research Skills - Sources and Documentation
- Sentence Structure
- Setting
- Structural Elements of Plot
- Theme
- Vocabulary
- World Literature

English

High School (Grades 9-12)

[\(Back to Humanities\)](#)

- American Literature
- Grammar
- Literary Analysis
- Literary Criticism
- Literary Devices
- Literary Periods
- Literary Themes
- Plays and Theater
- Prose and Poetry
- Punctuation and Capitalization
- Reading Comprehension
- Research Skills - Sources and Documentation
- Vocabulary
- World Literature

Essay Writing

[\(Back to Humanities\)](#)

- Business Writing
- Citation and Documentation
- College and Job Application Writing
- Cover Letter Writing
- Creative Writing
- Descriptive Essay
- Editing and Proofreading
- Elements of Composition
- Expository Essay
- Five Paragraph Essay
- Grammar
- Journal Writing
- Literary Analysis Writing
- Organization and Outlining Essays
- Paragraphs
- Persuasive Essay
- Poetry Writing
- Pre-writing Skills
- Punctuation and Capitalization
- Research Paper Writing
- Research Skills and Resources
- Resume Writing
- Speech Writing
- Story Writing
- Technical Writing
- Thesis Statements
- Topic Sentences
- Transitions
- Use of Literary Devices
- Vocabulary and Word Choice
- Voice
- Writing Conclusions
- Writing for Standardized Tests
- Writing Leads, Introductory Paragraphs, Conclusions
- Writing Research Papers
- Writing Sentences
- Writing Strategies
- Writing Styles

College Essay Writing

[\(Back to Humanities\)](#)

Business Writing
Citation and Documentation
Citation and Effective Content Analysis
College and Job Application Writing
Cover Letter Writing
Creative Writing
Descriptive Essay
Editing and Proofreading
Elements of Composition
Expository Essay
Five Paragraph Essay
Grammar
Journal Writing
Literary Analysis Writing
Organization and Outlining Essays
Paragraphs
Persuasive Essay
Poetry Writing
Pre-writing Skills
Punctuation and Capitalization
Research Paper Writing
Research Skills and Resources
Resume Writing
Speech Writing
Story Writing
Technical Writing
Thesis Statements
Topic Sentences
Transitions
Use of Literary Devices
Vocabulary and Word Choice
Voice
Writing Conclusions
Writing for Standardized Tests
Writing Leads, Introductory Paragraphs, Conclusions
Writing Research Papers
Writing Sentences
Writing Strategies
Writing Styles

Literature

[\(Back to Humanities\)](#)

Literary Periods and Movements

- Medieval Literature
- Renaissance Literature
- The Enlightenment
- Romanticism
- Transcendentalism
- Victorian Literature
- Realism
- Naturalism
- Modernism
- Post Modernism
- Existentialism
- Post-Colonial Literature

Literary Criticism

- Formalism
- Historical Criticism and New Historicism
- Feminist and Gender Criticism
- Psychological/Sociological Criticism
- Reader Response Criticism
- Structuralism/ Deconstruction
- Mythological Criticism
- Marxist Criticism

Prose Nonfiction

- Essay
- Biography
- Creative Nonfiction

Dramatic Elements/Genres

- Drama: Tragedy / Comedy / Tragicomedy / Heroic
- Classical Drama
- Medieval Mystery/Miracle Plays
- Renaissance Theater
- Comedy of Manners/Farce/Satire
- World Drama Traditions

Prose Fiction

- Short stories
- Novellas
- Novels
- World Fiction Traditions
- Poetry
- Epic
- Elegy
- Ballad
- Lyric
- Sonnet Italian / English
- Prosody: Rhyme / Meter / Rhythm / Stanza
- World Poetry Traditions

Literary Elements

- Character Types / Development
- Plot Structure
- Theme

Narrative Point of View: First, Second, Third Person

Setting: Geographic, Historical, Socio-Economic

Versification

Literary Devices

Symbolism/ Metaphor/ Simile

Hyperbole and Synecdoche

Allegory

Irony: Verbal / Dramatic

Figurative Language: Imagery

Mimesis/ Metonymy

Symbolic Logic

Inferences and Arguments (Premises and Conclusions)

- Recognition of argument
- Validity
- Soundness
- Contingency
- Factual Statements
- Invalidity
- Form versus Content
- Statements and Propositions
- Deductive versus inductive logic
- Sentential logic
- Terms, predicates, variables, and pronouns
- Compound formals
- Necessary versus sufficient conditions
- Statement connectives
- Truth-functional derivations

Categorical Propositions

- Components of a Categorical Proposition
- Venn diagrams and the square of opposition
- Aristotelian versus Boolean logic

Categorical Syllogisms

- Standard form, mood and figure
- Venn diagrams applied to syllogisms
- Rules
- Fallacies of Relevance
- Fallacies of Ambiguity

Propositional Logic

- Symbols and translation
- Truth functions
- Truth tables
- Tautology, contradiction, contingency, and replacement
- Complex truth-functional formals
- If statements versus Only if statements
- Symbolizing the statement form

Natural deduction in propositional logic

- Rules of implication and replacement
- Proving logical truths

Predicate Logic

Symbols and translation

Change of Quantifier

Relational and Overlapping Quantifiers

Translations in monadic predicate logic

Translations in polyadic predicate logic

Complex predicates

Wide-scope quantifiers

Derivations in predicate logic

Symbolizing the statement form

Logic Truth Trees

Propositional Logic

Predicate Logic

Reading

[\(Back to Humanities\)](#)

Describe features of different genres of writing or poetry. Apply suitable analysis strategies.

- Fiction- narrative -identify features and analyze
- Fiction-mystery/suspense- identify features and analyze
- Poetry- identify features and analyze
- Nonfiction-informational -identify features and analyze
- Nonfiction-persuasive -identify features and analyze
- Biography -identify features and analyze
- Other

Identify main ideas and details, both explicit and implied, within a text.

- Main idea- explicitly stated
- Main idea- implied
- Locating details

Draw valid inferences from a written text and be able to identify supporting text evidence.

- Create valid inferences
- Locate text evidence to support an inferred claim

Correctly identify point of view (first person, second person, third, etc.) and analyze for potential bias within a text.

- First person point of view features and characteristics
- Second person point of view features and characteristics
- Third person point of view features and characteristics
- Omniscient and Limited Omniscient Points of View
- Reliable/Unreliable point of view narration

Identify text structures (cause and effect, chronological order, etc.) within a given text.

- Cause and Effect
- Problem solution
- Compare/Contrast
- Description
- Main idea and Details
- Chronological Order (Sequence)

Use an appropriate graphic organizer or other systematic approach (i.e. note-taking) to demonstrate conceptual understanding of a text.

- Venn Diagram
- Identify an Author's purpose for writing
- Alphanumeric/Structured outline format
- Timeline
- Concept Web
- T-chart
- Other

Draw valid generalizations from a given text.

- Create and/or identify valid generalizations from a text.
- Locate text evidence to support a generalization

Correctly establish facts from a opinions within a text.

- Identify facts from a text
- Identify opinions from a text

Evaluate how graphic sources such as graphs, tables, charts, and other visual images increase understanding of a text.

- Analysis- graph, chart or table in a text
- Analysis- picture
- Other graphics in text context

Integrate main ideas and key details or events to create an effective summary of a text, passage, or book.

- Summarizing a passage
- Details in a summary
- Evaluate a given summary for completeness

Evaluate word meaning within a passage context, or in isolation.

- Vocabulary in isolation
- Vocabulary in context

Assess an author's purpose, use of tone, and theme based on a given text.

- Identify an Author's purpose for writing
- Identify tone of a given text
- Identify theme of a given text

Evaluate reliability of sources, giving consideration to tone, mood or potential bias of the author.

- Tone of text/effect on reliability
- Mood of text/effect on reliability
- Potential bias of author/effect on reliability

Evaluate persuasive writing to determine if an argument is presented logically, clearly, and adequately to influence the reader.

- Text features of persuasive writing
- Argument effectiveness

Formulate connections between texts, compare and contrast two texts on related topics.

- Text connections
- Compare/contrasts related texts

Explain pre-reading activities that increase comprehension.

- Justify pre-reading strategies
- Analyze effective pre-reading activities

Utilize figurative language and textual elements to gain a better understanding of literature.

Primary Reading

[\(Back to Humanities\)](#)

Comprehension

- Main idea and supporting details
- Synthesizing
- Summarizing
- Making predictions and inferences
- Questioning

Vocabulary and Word Recognition

- Root words and affixes
- Syllabication patterns
- Spelling patterns
- Context clues
- Phonemic awareness

Author's Craft

- Tone and mood
- Figurative language
- Point of view
- Author's purpose
- Theme
- Literary devices
- Types of genres

Text Structure

- Literary elements
- Cause and effect
- Problem / solution
- Compare and contrast
- Order and sequence
- Description
- Summarization

Understanding Features of Genres

- Poetry
- Fictional narratives
- Drama
- Informational texts
- Non-fiction

English Language Use

- Word form
- Verbs followed by gerunds or infinitives
- Verb tense formation and uses
- Time expressions
- Tag questions
- Subjunctive mood
- Subject-verb agreement
- Relative clauses
- Pronouns
- Prepositions
- Phrase usage: Neither, nor, such, so
- Phrasal verbs
- Passive causatives
- Passive and active voice
- Parts of a sentence
- Participial adjectives
- Modal verbs
- Irregular verb forms
- Indirect speech
- Countable and non-countable nouns
- Conditionals
- Comparisons
- Articles
- Sentence Diagramming
- Vocabulary--finding meaning in context
- Vocabulary--dictionary definitions, appropriate usage, collocations, word families, and connotations)
- Using dictionaries

English Writing

- Conventions of standard written English syntax
- Inversion
- Linking words and text organizers
- Parallel structure
- Prewriting--Brainstorming, outlining
- Finishing the writing process--revising & editing
- Avoiding Plagiarism
- Using sources--credibility, citation, synthesizing info
- Introductions and thesis statements
- Conclusions
- Paragraph construction (topic sentence, body, concluding sentence)

Types of Writing

- Critical Response
- Synthesis
- Argumentative
- Analysis
- Compare/contrast
- Narrative
- Descriptive
- Opinion
- Process

Summary/paraphrase

Research Papers

Speaking

Presentations

Daily communication--giving directions, giving advice, etc.

Pronunciation--Stress and intonation patterns

Pronunciation--Phonetic (International Phonetic Alphabet) transcription

Pronunciation--Identification of cause of pronunciation errors

Listening

Note taking

Processing academic discourse (lectures, presentations, videos, etc.)

Identifying main ideas vs. details

Visual Organizers (Venn diagrams, concept maps, etc.)

Predicting

Reading

Note taking

Reading and processing academic texts

Identifying main ideas vs. details

Visual Organizers (Venn diagrams, concept maps, etc.)

Skimming/scanning

Predicting

Use of English

- Articles
- Comparisons and Superlatives
- Conditionals
- Countable and non-countable nouns
- Determiners
- Indirect speech
- Irregular verb forms
- Modal verbs
- Participial adjectives
- Parts of a sentence
- Passive and active voice
- Passive causatives
- Phrasal verbs
- Phrase usage: Neither, nor, such, so
- Prepositions
- Pronouns
- Question formation
- Relative clauses
- Subject-verb agreement
- Tag questions
- Time expressions
- Uses of gerunds and infinitives
- Using dictionaries
- Verb tense formation and uses
- Vocabulary: definitions, usage, collocations, word families, and connotations.
- Vocabulary--finding meaning in context
- Word form/Morphology

English Writing

- Conventions of standard written English syntax
- Linking words and text organizers
- Essay structure and development
- Parallel structure
- Word order

Speaking

- Daily communication--giving directions, giving advice, etc.
- Differences between English pronunciation and spelling
- Presentations
- Pronunciation - Phonics as used in Primary ESL
- Pronunciation: Identification of cause of pronunciation errors
- Pronunciation: Phonetic (International Phonetic Alphabet) transcription
- Pronunciation: Stress and intonation patterns

Listening

- Identifying main ideas vs. details
- Listening comprehension strategies (scaffolding, note taking, predicting, etc)
- Processing contextual audio (lectures, presentations, videos, etc.)
- Visual Organizers (Venn diagrams, concept maps, etc.)

Reading

- Analysis of figurative language
- Identifying main ideas vs. details

Reading comprehension strategies (note taking, predicting, skimming, etc)

Visual Organizers (Venn diagrams, picture-walks, concept maps, etc.)

Pedagogy of ESL

Error correction strategies (response-repetition, prompting, recasting, integration, metalinguistic information, etc).

Concept of communicative competence

Differences among languages (phonology, morphology, syntax, and semantics)

Literacy learning strategies

Accounting

[\(Back to Business\)](#)

Financial Reporting and Accounting Cycle

- Accrual vs. cash accounting
- Worksheets and t-accounts
- Adjusting Entries
- Financial Statement Preparation (including direct/indirect statement of cash flows)
- Closing Entries

Accounting for Service and Merchandising Companies

- Journal Entries
- Multi-step income statements
- Perpetual vs. periodic
- LIFO, FIFO, & weighted average
- Accounting for uncollectible accounts (allowance method vs. direct write off method)

Internal Controls & Cash

- Bank reconciliations
- Petty cash

Accounting for Property, Plant, and Equipment

- Entries for PPE purchases
- Entries for PPE sales/disposal
- Depreciation (straight-line, double-declining-balance, units-of-production)

Accounting for Partnerships

- Forming a partnership
- Income allocation
- Partner admission/withdrawal
- Partnership liquidation

Accounting for Corporations

- Entries for stock
- Entries for dividends
- Stock splits
- Financial ratio analysis
- Treasury stock

Accounting for Investments

- Accounting for investments in stocks (purchase, sale, equity method, fair value method, etc.)
- Accounting for investments in bonds

Bonds Payable

- Accounting for bonds
- TVM Analysis for bonds
- Amortization & amortization tables

Payroll and Taxes

- Accounting for taxes
- Accounting for payroll

Managerial Accounting

- Job order costing
- Process costing
- Activity-based costing
- Cost-volume-profit analysis
- Variable vs. absorption costing
- Budgets

Planning, control, and performance evaluation

Differential analysis
Capital investment decisions

Intro Microeconomics

Comparative Advantage

- Opportunity Cost
- Production Possibilities Curve

Supply and Demand

- Market Equilibrium
- Income effect and substitution effect
- Price ceilings and floors

Elasticity

- Price Elasticity of Demand
- Income Elasticity and Cross-Price Elasticity of Demand
- Price Elasticity of Supply
- Taxes

Demand

- Marginal Utility
- Consumer Surplus

Perfectly Competitive Supply

- Short-Run Costs
- Long-Run Costs
- Profit maximization
- Producer Surplus

Monopoly, Oligopoly, and Monopolistic Competition

- Market power
- Economies of Scale
- Monopoly Marginal Revenue
- Price Discrimination
- Regulation

Game Theory

- Nash Equilibrium
- Prisoner's Dilemma
- Cartels

Market Failure

- Efficiency
- Adverse Selection
- Moral Hazard
- Externalities
- Coase Theorem
- Tragedy of the Commons

Intro Macroeconomics

Comparative Advantage

- Production Possibilities Curve
- Specialization
- International Trade
- Exchange Rates

Supply and Demand

- Market Equilibrium

GDP and Unemployment

National Income Measures
Measuring GDP
Nominal vs. Real GDP
Measuring Unemployment Rate

Price Level and Inflation

Consumer Price Index
Adjusting for Inflation
True Costs of Inflation
Aggregate Demand

Economic Growth and Productivity

Business Cycles
Labor Productivity
Capital
Human Capital
Technology

Labor and Wages

Real Wages
Demand for Labor
Supply of Labor

Saving and Capital Formation

Real Interest Rate
Stocks and Flows
National Saving
Fiscal Policy
Investment

Money and Prices

Money Supply
Federal Reserve System
Monetary Policy
Interest Rates
Velocity

Finance

[\(Back to Business\)](#)

- Role and objective of financial management
- Review of the four basic financial statements
- Analysis of financial statements and financial performance
- Markets and Financial Institutions
- Stock and Bond Valuation
- Time Value of Money
- Techniques of Analysis (cash flow valuation; capital budgeting and risk analysis)

Financial Choices of Firms

- Distributions to shareholders
- Dividends and share repurchases/treasury stock
- Managing current assets/working capital
- Financing current assets/managing current liabilities

The Financial Environment

- Markets, institutions, interest rates, and taxes
- Risk and rates of return
- Bonds and their valuation
- Stocks and their valuation
- Cost of capital
- Capital budgeting, including cash flow estimation, decision criteria, and risk analysis
- Capital structure and leverage
- Distributions to shareholders
- Dividends and share repurchases/treasury stock
- Managing current assets/working capital
- Financing current assets/managing current liabilities
- Financial planning, budgeting, and forecasting.

Intermediate Accounting

[\(Back to Business\)](#)

Accounting Cycle, Income Statement, Balance Sheet

- Accrual vs cash
- Adjusting entries
- Extraordinary items
- Financial statement presentation and disclosures

Statement of Cash Flows

- Indirect method of cash flows
- Direct method of cash flows
- Investing & financing cash flows

Time value of money

- PV and FV of lump sum
- PV and FV of annuities
- Deferred annuities

Revenue recognition issues

- General criteria for recognizing revenue
- Long term contracts
- Installment sales
- Multi-component contracts

Revenue , Receivables and Cash Cycle

- Sales adjustments (discounts, returns, allowances)
- Notes receivable
- Sale of receivables
- Cash equivalents
- Estimating uncollectible accounts & net realizable value

Inventory & Cost of Goods Sold

- Perpetual vs periodic systems
- Inventory valuation methods
- Lower of cost or market
- Special issues: in transit, consignment, purchase adjustments

Noncurrent operating assets

- Establishing asset cost
- Valuation of assets and impairment
- Depreciation and amortization methods
- Retirement, sale or exchange of assets

Debt

- Short term liabilities
- Bond pricing
- Bond issues and retirements

Equity

- Issuance of capital stock
- Treasury stock transactions
- Cash and stock dividends
- Accounting for share-based compensation

Investment in Debt & Equity Securities

- Classification of investment securities
- Recognition of revenue from investment securities
- Accounting for the change in value of securities
- Sale of securities

Leases

- Lease classification criteria
- Accounting for capital leases
- Accounting for operating leases

Income Taxes

- Computation of deferred assets and liabilities
- Carryback and carryforward of operating losses

Earnings Per Share

- Basic EPS
- Diluted EPS

Pensions

Contingencies

Accounting Changes and Error Corrections

- Changes in accounting principle
- Changes in accounting estimate
- Error corrections

Intermediate Economics

[\(Back to Business\)](#)

Macroeconomics

- RBC, Keynesian, New Keynesian, and Fischer Models
- Equilibrium in Endowment and Production Economies
- Consumption, Savings, Capital and Investment
- GDP and National Accounts
- IS-LM/AS-AD Model & Framework
- Output and Employment
- Uncertainty and Expectations
- Unemployment Modeling
- Fiscal Policy
- Money and Inflation

Microeconomics

- Consumer Theory
 - Preferences, Utility, Choice (Revealed Preference)
 - The Slutsky Equation
 - Choice Under Uncertainty: Expected Utility, Insurance, Lotteries, Risk Aversion
 - Compensating Variation
 - Budget Constraints
 - Demand
 - Consumer Surplus
- Theory of the Firm
 - Technology and Production Functions
 - Profit Maximization (Profit Function, Cost Minimization)
- Market Theory
 - Industry Supply under perfect competition
 - Monopoly/Oligopoly Behavior
 - Price Discrimination, Market Power, Tariffs
 - General Equilibrium and Efficiency
 - Externalities, Public Good
 - Market Failures and Corrections
- Game Theory
 - Game Theory Application
 - Monopoly and Oligopoly: Cournot and Stackleberg
 - Nash Equilibrium, Mixed Strategies
 - Sequential Games: Subgame Perfection
 - Adverse Selection, Bayesian Equilibrium, Signaling Equilibria
 - Moral Hazard: Insurance, Wages

Business Law

[\(Back to Business\)](#)

Foundations of Law

- Criminal vs. Civil Law
- Substantive vs. Procedural Law
- Sources of Law
- Administrative Law & Regulation
- Consumer Protection Laws
- Anti-Trust Regulations
- Unfair Trade Practices
- Employment Law & Labor Relations
- Professional Liability and Accountability
- Environmental Law

Dispute Settlement

- Means of Dispute Settlement
- State and Federal Court Organization
- Alternative Dispute Resolution
- Court Procedure
- Criminal Concerns
- Intentional Torts
- Liability

Contracts & E-Contracts

- Elements of Contracts
- Offer & Acceptance (Agreement)
- Consideration
- Form and Meaning
- Capacity
- Consent, Mistakes, Fraud, Undue influence & Duress
- Statute of Frauds & Writing Requirement
- Third Party Rights
- Performance and Discharge
- Breach & Remedies

Sales & Lease Contract Formation

- Uniform Commercial Code (UCC)
- Title
- Risk
- Insurable Interest
- Performance, Breach and Remedies
- Warranties & Limitations
- Products Liability

Agency and Employment

- Agency Formation and Duties
- Agency Rights and Remedies
- Agency Liability and Termination
- Employment at Will
- Employment Discrimination
- Employment & Immigration

Business Organization

- Partnerships
- Hybrid Business Forms
- Corporations Formation
- Management of Corporations

Property

- Personal Property vs. Real Property
- Landlord-Tenant Relationships
- Zoning & Government Regulations
- Estates and Trusts
- Insurance Terms, Concepts & Types
- Intellectual Property

Commercial Paper

- Negotiable Instruments Definition
- Transferability & Holder in Due Course
- Liability of Parties
- Checks and Electronic Fund Transfers
- E-money & Online Banking

Creditor Rights

- Creditor Rights and Remedies
- Debtor Protections
- Surety & Guarantees
- Bankruptcy Concepts
- Mortgage and Foreclosure

Principles of Management

[\(Back to Business\)](#)

History and Theories of Management

- Scientific Management
- Organizational Developments
- Sociotechnical Theory
- Hierarchy of Needs
- Five disciplines of the Learning Organization

The Role of Customer Relations

- Building customer relationships
- Promotions, Pricing & Credit
- Environmentalism (burdens and potentials)
- Psychological & Sociological influences

Professional Management & Managing Growth

- Managing Human Resources
- Managing Operations
- Managing Risk
- Leadership & Authority
- Time management

Entrepreneurial Opportunities

- Small Businesses Concepts

Ethics in Business

- Integrity framework
- Supporting Organizational Culture

Business Analysis

- SWOT
- Internal & External (outside-in analysis & inside-out analysis)

The Business Plan

- Function of and formatting plan
- Main types of plans

Employee Relations & Leadership

- Roles in motivation
- Specifying structure and creating balance

Legal forms of Organizations

- Sole proprietorship, partnerships, C corp, LLC, etc.

Financial Planning

- Income statement
- Balance sheet
- Cash Flow statement
- Financial forecasting
- Debt & Equity

Product & Supply Chain Management

- Product lifecycle
- Branding, labeling, strategies

Psychology

[\(Back to Social Sciences\)](#)

History and Research

Approaches/schools of psychology

Biological approach

Structuralism

Functionalism

Gestalt

Freud & psychoanalysis

Behaviorism

Cognitive revolution

Research approaches:

Experimental approach (scientific method)

Correlational research

Clinical research

Ethics in research, clinical and applied psychology

Biopsychology

Physiological research techniques

Nervous system – functional organization

Neurons, electrical and chemical signaling

Neuroanatomy

Endocrine system

Animal models in psychology, evolution

Genetics

Neuroplasticity

Sensation and Perception

Sensory systems & receptors

Vision

Audition

Olfaction

Gustatory

Tactile

Proprioception

Attention

Perceptual processes

Psychophysical mechanisms

Adaptation

Threshold

Signal detection

Consciousness

Sleep and dreaming

Sleep and dreaming

Meditation

Psychoactive drugs and consciousness

Conditioning and Learning

Biological (neural) basis for learning

Classical conditioning

Operant conditioning

Observational learning

Cognitive processes in learning

Constructivism

Social learning

Implicit learning

Cognition

Memory

- Working memory
- Memory storage and retrieval
- Long & short term memory
- Semantic/episodic
- Implicit/explicit
- Forgetting
- Memory errors

Language

- Development
- Speech
- Reading

Thinking

- Concepts
- Categories

Problem solving

- Decision making
- Analogical problem solving
- Creativity
- Insight

Intelligence

- IQ
- Intelligence testing
- General/specific intelligences
- Cultural impact

Motivation, emotion

Biological basis

- Emotion and the brain
- Hunger
- Thirst
- Sex
- Pain

Social motivation

Theories of emotion

Stress

Developmental

Types of development

- Physical
- Cognitive
- Social
- Moral

Gender, sex, and sexuality

Heredity and environment

Lifespan: prenatal through geriatric

Developmental research methods

- Longitudinal
- Cross-sectional

Personality

Assessment: measuring personality

Theories of personality

- Type
- Trait
- Behaviorist
- Biopsychological
- Psychodynamic
- Humanistic
- Social cognitive

Self-concept and self-esteem

Psychological disorders

Defining “normality” and “abnormality”

Anxiety disorders

Dissociative disorders

Mood disorders

Neurocognitive disorders

Personality disorders

Psychoses

Somatoform disorders

Health, stress, coping

Treatment

Psychological therapies

- Behavioral

- Cognitive

- Humanistic

- Group

- Psychodynamic

Medical therapies, psychopharmacology

Community psychology

Social psychology

Aggression & antisocial behavior

Attitudes, attitude change

Attribution processes

Conformity, compliance & obedience

Group dynamics

Interpersonal perception

Cultural influences

Statistics, tests, measurement

Descriptive & inferential statistics (definitions)

Measurement, operational definitions

Reliability and validity

Samples, populations, standardization & norms

Scientific Method

- Cause and effect
- Research hypotheses
- Testability

Developing research ideas

- Defining and using constructs
- Theories, models, and hypotheses
- Pilot research

Literature searches

- Conducting a literature search
- Evaluating quality of sources
- Peer review
- Reading journal articles

Research ethics

- Belmont report
- Deception
- Institutional Review Boards and human-subjects research
- Animal Care and Use Committees and non-human subjects

Bias

- Experimenter bias
- Participant bias
- Research and Culture

Sampling

- Populations and samples
- Probability sampling methods
- Nonprobability sampling
- Sampling Error

Validity and Reliability

- Internal validity
- External validity
- Threats to validity
- Measurement
- Inter-rater reliability

Non-Experimental & Quasi-Experimental Research

- Correlational studies
- Pre-Post, time-series, and longitudinal designs
- Quasi-independent variables
- Ex Post Facto research
- Survey construction and administration
- Likert scale questions
- Tests, Inventories, and self-report

Qualitative research

- Naturalistic observation
- Case study
- Focus groups
- Coding and categorizing

Small-N and single-subject designs

- Phases and phase changes
- Reversal designs
- Multiple baseline designs
- Evaluating single-subject research

Quantitative research and Experimental Design

- Independent variables
- Dependent variables and measurement choices
- Control
- Counterbalancing
- Extraneous variables
- Confounding variables
- Group selection
- One factor, two or more groups
- Factorial designs
- Interaction
- Sample size and power

Evaluating Research

- Hypothesis testing
- Appropriate statistical tests for experimental design
- Interpreting statistical results
- Effect size
- Drawing conclusions
- Generalizability
- Causality

Tutors should be familiar with parametric and nonparametric hypothesis tests included in the College Statistics subject.

Introduction to Sociology

[\(Back to Social Sciences\)](#)

History and Theory

- Purpose of Sociology
- Sociological Imagination
- Structural Functionalism
- Conflict Theory
- Symbolic Interactionism
- Social Exchange Theory
- Ethnomethodology
- Individual and Society
- Social Context of Time, Place, and Location
- Macro- and Micro- Approaches

Theories of Self

- Socialization and the Self
- Looking Glass
- "I" and "Me"
- Dramaturgy
- Status
- Role Conflict, Strain, Performance, and Expectation
- Emotions

Culture and Society

- Norms, Customs, Traditions, Values, Symbols, and Language
- Ethnocentrism
- Cultural Relativism
- Group Behavior
- Power
- Authority
- Leadership

Social Class

- Class Systems
- Inequality
- Income and Wealth
- Subcultures
- Labor Market
- Division of Labor
- Economic Systems
- Privilege and Oppression
- Social Mobility

Deviance and Social Control

- Deviance
- Labelling
- Misdemeanor and Felony
- Group Dynamics
- Criminal Justice
- Punishment
- Social Control
- Stigma

Race/Ethnicity

- Common Culture
- Shared Experience
- Divisions
- Inequalities

- Dominant Group
- Minority Group(s)
- Discrimination
- Prejudice
- Racism
- Homogeneity and Heterogeneity

Gender/Sex

- Biological Traits
- Gender Norms
- Gender Orders
- Masulinity/Femininity
- Personal Identity
- Feminism
- Heterosexism

Sexuality

- Sexual Attraction
- Relationship with Sex and Gender
- Non-binary sexuality
- Sexual Harrasment
- Homophobia

Social Institutions and the Family

- Education
- Schooling and Social Class
- Types of Families
- Nuclear/Extended
- Types of Marriage
- Religion
- Protestant Work Ethic
- Religious Organization - Denominations, Cult, Church, Sect
- Types of Politics
- Capitalism, Socialism, and Communism
- Demography
- Deindustrialization
- Migration
- Health
- Morbidity and Mortality

Social Change

- Social Change and Dilemmas
- Threat to Social Order
- Group Reluctance
- Social Change and Movements

Research Methods

- Qualitative Methods
- Quantitative Methods
- Mixed Methods
- Independent and Dependent Variables
- Mean/Median/Mode
- Sample
- Hypothesis

Proficiency with Excel 2010 required, preferably older versions as well.

Environment & Capabilities

- File Tab
- Excel Options – including finding and customizing
- Templates – including finding and implementing
- Add-Ins – including finding and installing

Toolbars

- Ribbon – including identification, usage, customization, etc.
- Quick Access Toolbar – including identification, usage, customization, etc.
- Custom Tabs – including creation and arrangement of custom tabs, custom groups, etc.
- Formula Bar and Name Box

Spreadsheet Basics

- Rows and Columns
- Ranges – including selecting, naming, finding, using named ranges, etc.
- Views – including page layout, page break, custom, etc.
- Entering Data
- Printing
- Worksheet Management – including inserting, deleting, hiding, unhiding, moving, copying, etc.
- Panes and Page Breaks
- Headers and Footers – inserting, using templates, customizing, etc.
- Keyboard Shortcuts

Formatting

- Formatting Cells, Worksheets, Workbooks
- Format Painter
- Paste Special
- Conditional Formatting – including built-in styles and formula-based styles

Filtering & Sorting

- Filters – including implementing, using, customizing, etc.
- Sorting – including basic and custom sorts

Formulas & Functions

- Entering Formulas – including basic formula syntax, etc.
- Using Functions – including commonly used functions, using function helper, etc.
- Evaluating Formulas and Function Results – including tracing formulas/precedents, error checking, etc.
- Interpreting and Troubleshooting Formulas and Functions
- Calculation Operations – including manual vs. automatic

Charts, Tables, & PivotTables

- Creating, Using, and Formatting Charts
- Creating, Using, and Formatting Tables
- Creating, Using, and Formatting PivotTables
- Smart Art and Illustrations
- Sparklines

Importing & Exporting

- Importing and Exporting Data/Documents
- Importing and Exporting Pictures
- Picture Editing

Macros

- Recording Macros
- Running Macros

Saving, Sharing & Protecting

- Auto-Save – including default settings and customizing

Recovery
File Types (e.g., .xls, .xlsx, .xlsm, etc.)
Sharing and Protecting Worksheets and Workbooks
Evaluating Changes in Shared Documents

Proficiency with Word 2010 required, preferably older versions as well.

Program Fundamentals

- Giving Commands in Word
- Using Command Shortcuts
- Creating, Opening, Previewing, Printing, Saving, and Closing a Document
- Using Help

Getting Started with Documents

- Entering, Deleting, Selecting, and Replacing Text
- Navigating, Browsing, and Viewing a Document
- Working with the Document Window and Viewing Multiple Document Windows

Working With and Editing Text

- Checking Spelling and Grammar
- Finding and Replacing Text
- Using Word Count and the Thesaurus
- Inserting Symbols and Special Characters
- Copying and Moving Text
- Collecting Multiple Items to Move or Copy
- Using Undo, Redo, and Repeat

Formatting Characters and Paragraphs

- Changing Font Type, Size, Color, Highlighting, Styles, and Effects
- Applying Spacing and Ligatures
- Creating Lists
- Changing Paragraph Alignment, Paragraph Spacing, and Line Spacing
- Adding Paragraph Borders and Shading
- Copying Formatting
- Setting, Adjusting, and Removing Tab Stops
- Using Left and Right Indents, and First Line and Hanging Indents

Formatting the Page

- Adjusting Margins, Page Orientation, and Size
- Using Columns, Page Breaks, Section Breaks, Line Numbers, and Hyphenations
- Working with the Page Background
- Rearranging, Numbering, and Viewing an Outline
- Rearranging and Navigating Long Documents
- Using Headers, Footers, Bookmarks, Cross-references, Footnotes, Endnotes, Citations, and Bibliographies
- Working with Picture Captions
- Adding a Table of Contents, Index, Cover Page, and Page Numbers

Working with Themes and Styles

- Creating, Modifying, Applying, and Deleting a Style
- Working with the Styles Gallery
- Creating a New Quick Style Set
- Selecting, Removing, and Printing Styles
- Comparing and Cleaning Up Styles
- Applying Document Themes
- Creating and Saving New Theme Colors and Fonts

Working with Shapes and Pictures

- Inserting and Formatting Clip Art, Screenshots, Pictures, Text Boxes, Shapes, and Graphics Files
- Removing a Picture's Background
- Formatting and Otherwise Altering the Look of Pictures and Graphics
- Resizing, Moving, Copying, Positioning, Grouping, and Deleting Objects
- Applying Special Effects

Aligning, Distributing, Flipping, Rotating, and Layering Objects

Working with WordArt, SmartArt, and Charts

- Inserting, Editing, and Formatting WordArt
- Inserting and Formatting SmartArt
- Working with SmartArt Elements
- Inserting, Editing, and Formatting a Chart
- Working with Labels
- Using Chart Templates

Working with Tables

- Creating, Resizing, Moving, and Manipulating a Table
- Adjusting Table Alignment and Text Wrapping
- Working with Cell Formatting
- Merging and Splitting Cells and Tables
- Inserting and Deleting Rows and Columns
- Adjusting Row Height and Column Width
- Using Table Drawing Tools
- Working with Sorting and Formulas
- Working with Borders and Shading
- Using Table Styles and Table Style Options
- Converting or Deleting a Table
- Using Quick Tables

Working with Mailings

- Setting Up the Main Document for Mail Merge
- Creating and Editing a Data Source
- Selecting an Existing Data Source
- Inserting Merge and Rules Fields
- Previewing and Completing a Mail Merge
- Creating Labels and Envelopes

Using Collaborative Editing Tools

- Tracking, Accepting, and Rejecting Revisions
- Using Comments
- Comparing and Combining Documents
- Protecting a Document (with or without password)

Working with Templates

- Creating and using a Document Template
- Creating and Using Building Blocks and AutoText
- Attaching a Different Template to a Document
- Copying Styles between Documents and Templates

Working with Forms

- Creating a New Form
- Adding Content Controls
- Assigning Help to Form Content Controls
- Preparing the Form for Distribution
- Filling Out a Form

Customizing Word

- Customizing the Ribbon and Quick Access Toolbar
- Using and Customizing AutoCorrect
- Changing Word's Default Options

More Topics

- Converting an Older Document to Word 2010
- Translating Text
- Publishing a Blog Entry

Using Hyperlinks
Viewing Document Properties and Finding a File
Recovering Your Documents
Managing Versions
Recording, Playing, and Deleting a Macro

MS PowerPoint

[\(Back to Technology\)](#)

- Apply and change advanced options
- Customizing the ribbon
- Customizing the quick access toolbar
- Creating/using macros
- Using different view options
- Proofreading options
- Creating presenter notes
- Setting up a slideshow
- Adding animations
- Utilizing transitions
- Using & creating themes
- Inserting charts & graphs
- Inserting images
- Grouping shapes and pictures
- Creating tables
- Inserting text options
- Using audio & video in presentations
- Working with watermarks
- Creating and printing handouts
- Adding headers & footers
- Flowchart creation
- Using and creating templates
- Using drawing tools
- Adding, removing, publishing slides
- Creating layouts
- Save & send options
- Font options
- Print options
- Properties and Protecting File

NOTE: Computer Science tutors are expected to be familiar with all concepts on this list *in addition to* the language-specific list of the subject(s) they would like to tutor.

Object-Oriented Program Design

Program design

Read and understand a problem description, purpose, and goals

Apply data abstraction and encapsulation.

Read and understand class specifications and relationships among the classes ("is-a," "has-a" relationships).

Understand and implement a given class hierarchy.

Identify reusable components from existing code using classes and class libraries.

Class design

Design and implement a class.

Choose appropriate data representation and algorithms.

Apply functional decomposition.

Extend a given class using inheritance.

Program Implementation

Implementation techniques

[Backtracking](#)

[Greedy algorithms](#)

[Divide and conquer](#)

[Modular programming](#)

Methodology

Object-oriented development

Top-down development

Encapsulation and information hiding

Procedural abstraction

Programming constructs

Primitive types vs. objects

Declaration

Constant declarations

Variable declarations

Class declarations

Interface declarations

Method declarations

Parameter declarations

Console output (System.out.print/println)

Control

Methods

Sequential

Conditional

Iteration

Understand and evaluate recursive methods

Java library classes

C++ library classes

Program Analysis

Testing

Test classes and libraries in isolation.

Identify boundary cases and generate appropriate test data.

Perform integration testing.

Debugging

Categorize errors: compile-time, run-time, logic.

Identify and correct errors.

Employ techniques such as using a debugger, adding extra output statements, or hand-tracing code.

Understand and modify existing code

Extend existing code using inheritance

Understand error handling

Understand runtime exceptions.

Reason about programs

Pre- and post-conditions

Assertions

Analysis of algorithms

Informal comparisons of running times

Exact calculation of statement execution counts

Basic big-O questions

Numerical representations and limits

Representations of numbers in different bases

Limitations of finite representations (e.g., integer bounds, imprecision of floating-point representations, and round-off error)

Standard Data Structures

Simple data types (int, boolean, double)

Classes

Lists

Arrays

Sets and Multisets

Stacks

Dictionaries

Queues

Trees, binary trees, and binary search trees

Standard Algorithms

Operations on data structures previously listed

Traversals

Insertions

Deletions

Searching

Sequential

Binary

Bubble Sort

Selection Sort

Insertion Sort

Mergesort

Computing in Context

System reliability

Privacy

Legal issues and intellectual property

Social and ethical ramifications of computer use

Software Methodology

NOTE: Computer Science tutors wishing to tutor C++ are expected to be familiar with all concepts on this list **in addition to** the Computer Science Principles list.

Namespaces**Functions****Control Structures**

- Conditional (if, if else, else, switch statements)

- Iteration (for, while, do-while loops)

- Break and continue

Input/Output

- Standard (iostream)

- File I/O (fstream)

Strings**Pointers****Exception Handling**

- Try/Catch blocks

- Throw statement

Arrays**Classes and Structs****Operator Overloading****Parameters**

- Call by reference vs Call by value

Inheritance

NOTE: Computer Science tutors wishing to tutor Java are expected to be familiar with all concepts on this list **in addition to** the Computer Science Principles list.

Primitive Data Types

- Integers
- Floating Point Types
- Characters
- Boolean

Literals

Variables

- Variable Scope
- Initializing Variables

Operators

Type Casting and Conversion

Control Statements

- For loops
- While Loops
- If-Else Statements
- Switch Statements

Classes

- Constructors
- Class Definitions
- Object Instantiation

Methods

- Using Parameters
- Method Overloading
- Returning Values

Arrays

- Multidimensional Arrays
- Irregular Arrays

Strings

- Constructing Strings
- Operating on Strings

Bitwise Operators

Static Keyword

File I/O

Inheritance and Polymorphism

- Superclasses and Subclasses
- Abstract Classes
- Method Overriding

Packages and Interfaces

- Packages and Member Access
- Implementing Interfaces

Exception Handling

- Using Try-Catch-Finally
- The Exception Hierarchy

Enumerations

Generics Fundamentals

NOTE: Computer Science tutors wishing to tutor Python are expected to be familiar with all concepts on this list **in addition to** the Computer Science Principles list.

Lists

Control Flow and Looping (while/for, use of the range() function instead of traditional for loop)

Tuples (relation to lists, unpacking)

List/Dictionary/Generator comprehensions

"Dunder" methods (__init__, __plus__, etc)

Variadic arguments (*args)

Keyword arguments (kwargs)**

List slices

Generators (yield)

Lambda functions

Dictionaries

Functions (including map, filter, reduce)

Files

Internet Fundamentals

- Layers of the Internet (application, transport, etc..)
- URL
- Pathway
- FTP and File Management
- Protocols (HTTP, HTTPS)

HTML

- Basic XML
- HTML Structure
- Lists
- Classes and IDs
- Tables
- Linking Resources
- Special Tags
- Div and Span
- Forms

CSS

- Selectors
- Alignment
- Element Position
- Padding and Margins
- Content Decoration
- Variables
- Layout
- Multiple Browser Support

Fundamental Javascript

- Basic programming concepts (functions, loops, etc..)
- DOM
- Events

PHP

- Variables, including PHP Reserved Variables
- Control Structures
- Functions
- Mixing HTML and PHP
- Handling Input (e.g. GET, POST, PUT, DELETE)
- REGEX for PHP
- php.ini

Accessibility

- Web Accessibility Standards
- Presentation of content
- Operable and understandable user interfaces
- Different web browsers and devices like mobile

Database Systems

[\(Back to Technology\)](#)

Database Design

- Primary Keys and Foreign Keys
- Indexes
- Views
- Creation of ERD
- 1NF,2NF and 3NF

CRUD Statements

- INSERT Statement
- SELECT Distinct Statement
- SELECT TOP statement
- UPDATE Statement
- DELETE Statement

Advanced Queries

- Designing Advanced queries
- Query optimization
- Common Table Elements
- Joins

Filtering Query Output

- WHERE Statement
- ORDER BY Statement
- Applying logical filters

Hosting Databases

- Connection Strings
- Database IP
- IOPS Limits and Storage limits
- Monitor Database Health

Remote Database Access

- Designing a client application
- Result Sets
- Designing a Report

Database Management Systems

- SQL Server
- Oracle
- MS Access

Spanish

[\(Back to Languages\)](#)

Basic Sentence Structure

- Gender & Number of Nouns
- Definite Articles
- Indefinite Articles
- Noun-Adjective Agreement
- Negation (& Double Negatives)
- Contractions Al / Del
- Questions and Exclamations

Advanced Sentence Structure

- Direct and Indirect Object Pronouns
- Relative Pronouns & Adjectives
- Possessive Pronouns
- Superlatives
- Demonstratives
- Comparisons of Quantity and Number
- The Personal "a"
- Por vs. Para
- Pero / Sino / Sino Que

Basic Verb Forms

- Present Indicative
- Stem Changing Verbs
- Gustar Type Verbs
- Irregular 1st Person Verbs ("go, zco, jo, oy, eo "verbs)
- Present Progressive
- Ser vs. Estar
- Saber vs. Conocer

Intermediate Verb Forms

- Preterit (Definite Past)
- Imperfect (Undefined Past)
- Reflexive Verbs
- Conditional Tense
- Future Tense
- Irregular Preterit Verbs

Advanced Verb Forms

- Subjunctive Tenses & Conditions
- Perfect Tenses
- Past Participles
- Formal Commands
- Informal (tú) Commands
- Negative Commands

Idiomatic Expressions

- Acabar de
- Hay / Hay que
- Hace... (To indicate time that has passed)
- Valer la Pena

Basic Vocabulary Units

- Ordinal Numbers
- Telling Time
- Expressions for Weather

Sports & Recreation
Science & Technology
Animals
Home Decor and Furnishings
Food & Kitchen
School & Office
Family Expressions & Relationships
Clothing
Medical Care & Human Physiology
Feelings & Emotions
Travel (Train & Air)
Customary Greetings & Protocol

Basic Sentence Structure

Gender & Number of Nouns

Vocabulary (including but not limited to...)

Numbers and time
Greetings, letter writing, speaking on the phone
Food and drink
Marketplace
Clothing
Education and careers
Personal relationships, friends, family
Emotions
Hobbies, sports, leisure, travel
Animals, plants, scenery, weather
Body parts, illnesses, basic medical terms
Residences, rooms, furniture
Government, public institutions, infrastructure, news
French/English *faux amis*
Common French idioms

Grammar and Style

Verb conjugations, tenses, and moods
Indicative present and imperative
Passé composé, including which verbs take *avoir* and *être*
Imperfect (*imparfait*), including when to use it instead of *passé composé*
Literary use of *passé simple*
Indicative future
Conditional present and past
Pluperfect (*plus-que-parfait*)
Subjunctive present and past, including when to use subjunctive instead of indicative
Past participle (e.g. *mangé*) and present participle (e.g. *mangeant*)

Pronouns

Subject pronouns (*je, tu, il...*)
Direct object pronouns (*me, te, le...*)
Indirect object pronouns (*me, te, lui...*)
Stressed pronouns (*moi, toi, lui...*)
Possessive pronouns (*le mien, le tien...*)
Demonstrative pronouns (*celui, celle...*)
Relative pronouns (*que, qui, lequel...*)
y and *en*
Order of pronouns in sentence

Determiners

Definite articles (*le, la, les*)
Indefinite articles (*un, une, des*)
Partitive articles (*du, de la*)
Possessive articles (*mon, ton, son...*)
Demonstrative articles (*ce, cette, ces*)

Other grammatical components

Adjectives, including comparative and superlative adjectives (e.g. *meilleur*)
Adjective placement relative to noun
Adverbs, including comparative and superlative adverbs (e.g. *bien, mieux*)
Prepositions

Sentence structures

Negation

Interrogative sentences

Passive voice

Conditional constructions

Compound and complex sentences with independent and dependent clauses

Literature (including but not limited to...)

Louise Labé

Jean-Jacques Rousseau

Guy de Maupassant

Paul Verlaine

Jules Verne

Victor Hugo

Albert Camus

Pronunciation and Phonetics

Describe how French vowels and certain French consonants differ from their English counterparts

Identify silent consonants and vowels

Identify and pronounce nasalized vowels

Use *liaison* and *enchaînement* to enhance euphony

Describe how stress functions in words and sentences

Describe how pronunciation and stress differ in poetry

French History and Culture

Basic history of France, from Roman Gaul to modern times

Basic geography of France, French territories, and other French-speaking nations

French education system

Present-day government of France

French holidays and customs

German

[\(Back to Languages\)](#)

Adjectives

- Adjective Endings
- Comparative & Superlative
- Definite & Indefinite Articles
- Der-* & *ein-*Words
- Extended Adjective Modifiers
- Present & Past Participles

Adverbs

- Expressions of Time
- Negation

Conjunctions

- Coordinating Conjunctions
- Subordinating Conjunctions
- Main and Subordinate Clauses

Nouns

- Appositives
- Case: Nominative, Accusative, Dative, & Genitive
- Gender

Prepositions

- Accusative, Dative, Genitive, & Two-way
- da-* & *wo-*compounds
- Idiomatic Use of Prepositions

Pronouns

- Personal, Interrogative, Demonstrative, Indefinite, Possessive, Relative, & Reflexive

Punctuation

- Comma Rules

Verbs

- Conjugation
- Imperative
- Indirect Discourse & Subjunctive I
- Infinitival Constructions (*um...zu*, (*an*)*statt...zu*, *ohne...zu*)
- Modal Verbs
- Passive Voice, Statal Passive, Alternatives to Passive
- Regular & Irregular Verbs
- Subjunctive II
- Tense: Present, Present Perfect, Simple Past, Past Perfect, Future & Future Perfect
- Verbs with Separable & Inseparable Prefixes

Word Order

Italian

[\(Back to Languages\)](#)

Basic Sentence Structure

- Italian alphabet, special characteristics
- Regular verbs
- Greetings
- Common salutations
- Expressing opinions
- Masculine versus feminine nouns
- Pronouns

Numbers/currency

Date

Time

Weather/seasons

Action verbs

Direction, travel

Culinary, food

Advances sentence structure

- Irregular verbs
- Direct pronouns
- Indirect-object pronouns
- Reflexive verbs
- Adjectives
- Using prepositions
- Imperfect subjunctive
- Il congiuntivo trapassato
- Il congiuntivo passato
- Il congiuntivo futuro
- Modal verbs
- Articulated prepositions
- Double object pronouns
- Future perfect
- Words with dual meaning
- Adverb
- Negative statements
- Conosce/Sapere
- Prepositions

Anatomy/Medical/Dental

- Body parts
- Symptoms
- Study of

Italian lifestyle

- Culture
- Politics
- Current affairs
- Business
- Professional writing
- Culinary, food