# Basic Concepts List

for All Available Subjects

## Math

<table>
<thead>
<tr>
<th>Elementary Math</th>
<th>Mid-level Math</th>
<th>Algebra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebra II</td>
<td>Geometry</td>
<td>Trigonometry</td>
</tr>
<tr>
<td>Pre-Calculus</td>
<td>Calculus</td>
<td>Calculus BC</td>
</tr>
<tr>
<td>Multivariable Calculus</td>
<td>Discrete Math</td>
<td>Finite Math</td>
</tr>
<tr>
<td>Statistics</td>
<td>Intermediate Statistics</td>
<td>Quantitative Reasoning</td>
</tr>
<tr>
<td>Quantitative Methods</td>
<td>Linear Algebra</td>
<td>Ordinary Differential Equations</td>
</tr>
</tbody>
</table>

## Science

<table>
<thead>
<tr>
<th>Elementary Science</th>
<th>Earth Science</th>
<th>Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>Physics – Algebra Based</td>
<td>Physics – Calculus Based</td>
</tr>
<tr>
<td>Anatomy &amp; Physiology</td>
<td>Microbiology</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>Health Administration</td>
<td>Nursing</td>
<td>Nursing RN (Pediatrics)</td>
</tr>
<tr>
<td>Medical Coding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Humanities

<table>
<thead>
<tr>
<th>Social Studies</th>
<th>English</th>
<th>Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essay Writing</td>
<td>College Essay Writing</td>
<td>Primary Reading</td>
</tr>
<tr>
<td>Reading</td>
<td>Primary ESL</td>
<td>ESL</td>
</tr>
<tr>
<td>Symbolic Logic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Social Sciences

<table>
<thead>
<tr>
<th>Introduction to Psychology</th>
<th>Research Methods</th>
<th>Introduction to Sociology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Business

<table>
<thead>
<tr>
<th>Introductory Accounting</th>
<th>Intermediate Accounting</th>
<th>Introductory Economics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate Macroeconomics</td>
<td>Intermediate Microeconomics</td>
<td>Finance</td>
</tr>
<tr>
<td>Cost Accounting</td>
<td>Managerial Accounting</td>
<td>Tax Accounting</td>
</tr>
<tr>
<td>Principles of Management</td>
<td>Business Law</td>
<td></td>
</tr>
</tbody>
</table>

## Technology

<table>
<thead>
<tr>
<th>MS Access</th>
<th>MS Excel</th>
<th>MS Word</th>
<th>MS PowerPoint</th>
<th>Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principles of CS</td>
<td>C++</td>
<td>Java</td>
<td>Python</td>
<td>Web Design</td>
</tr>
<tr>
<td>Database Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Foreign Languages

<table>
<thead>
<tr>
<th>French</th>
<th>German</th>
<th>Italian</th>
<th>Spanish</th>
</tr>
</thead>
</table>

Page | 1
Elementary (Grades 4-6)

**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
Mid-Level (Grades 7-8)

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
Algebra

**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
Algebra II

**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
Geometry

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
Trigonometry

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

Introduction to Trigonometry: Linear Relationships and Functions
- Introduction to Trigonometry
- 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
Pre-Calculus

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
- Compute 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

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 plan
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 computer the inverse of two-by-two and three-by-three matrices
Computer 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 nth term
Write a particular term of a sequence when given the nth 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
Calculus

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
- Trigonometric graphs
- Perform translations for various conic sections
- Law of Cosines and Law of Sines
- Arithmetic and Geometric sequences
- Functions and Graphs (Linear and Polynomial)
- Trigonometric Ratios and Identities
- Exponential and Logarithmic Functions
Calculus BC

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
  Rolles 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
  Riemanns 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
Multivariable Calculus

Vectors & Geometry of Space in Multiple Dimensions
- Two Dimensional Coordinate Systems
- Three Dimensional Coordinate Systems
- Vectors
- Cylindrical Coordinates
- Spherical Coordinates
- The Dot Product
- The Cross Product
- Equations of Lines and Planes
- Cylinders and Quadric Surfaces
- Functions of Several Variables

Vector Functions
- Vector Functions and Space Curves
- Derivatives of Vector Functions
- Integrals of Vector Functions
- Tangent, Normal, and Binormal Vectors
- Arc Length and Curvature
- Motion: Position, Velocity, and Acceleration

Multivariable Differentiation
- Limits and Continuity
- Partial Derivatives
- Differentials
- Chain Rule
- Tangent Planes and Linear Approximations
- The Gradient Vector Operator and Directional Derivative
- Critical Points: Relative and Absolute Extrema
- Lagrange Multipliers

Multivariable Integration
- Double Integrals over General Regions
- Double Integrals in Polar Coordinates
- Applications of Double Integrals
- Triple Integrals
- Triple Integrals in Cylindrical and Spherical Coordinates
- Applications of Triple Integrals
- Change of Variables: Jacobian of a Transformation

Vector Calculus: Line Integrals
- Vector Fields
- Line Integrals
- The Fundamental Theorem for Line Integrals
- Conservative Vector Fields
- Potential Functions of Vector Fields
- Green’s Theorem
- The Divergence and Curl Vector Operators

Vector Calculus: Surface Integrals
- Parametric Surfaces and Area
- Surface Integrals
- Stokes’ Theorem
- Gauss’ Divergence Theorem
Finite Math

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 x 2 games - geometric approach  
Linear programming and m x n games - simplex method and the dual
Discrete 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.
Statistics

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
Intermediate Statistics

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 Type 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
Quantitative Reasoning

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

Inductive/Deductive Reasoning

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

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
Linear Algebra

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 x 2 and 3 x 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
Ordinary Differential Equations

Introduction to Ordinary Differential Equations
Define and classify differential equations
Determine whether a function is a solution to a DE
Existence and Uniqueness Theorem
Principle of Superposition

1st order Ordinary Differential Equations
Identify 1st order linear, separable, exact, Bernoulli, and homogeneous 1st order ODEs
Find general solution for 1st order ODEs
Solve 1st order initial value problems
Construct and solve ODEs for applications such as mixtures, populations, and Newtonian Mechanics

Gaining information about ODEs without solving
Identify autonomous 1st order ODEs
Find and classify equilibrium solutions to autonomous 1st order ODEs with constant coefficients
Predict end behavior of solution to autonomous ODE given initial condition
Construct, identify, and interpret slope/direction fields
Euler’s method

Higher Order ODEs
Linear independence of solutions
Construct and solve problems involving harmonic motion, electrical circuits, and projectile motion
Solve linear higher order ODEs with constant coefficients using method of undetermined coefficients
Find second solution to 2nd order ODE using method of Reduction of Order
Find particular solution to 2nd order nonhomogeneous ODE using variation of parameters
Solve Cauchy-Euler equations

Laplace Transforms
Compute Laplace transforms of simple functions using definition of Laplace transform
Compute Laplace transforms of polynomial, exponential, and trig functions using table
Solve IVPs using Laplace transforms

Power Series Solutions of ODEs
Manipulate power series
Identify ordinary and singular points of ODEs
Evaluate recurrence relations
Find power series solutions of ODEs

Systems of 1st Order Differential Equations
Use row operations to reduce matrices
Compute eigenvalues and eigenvectors of square matrices
Solve system of two 1st order linear ODEs with constant coefficients using matrix methods
Convert 2nd order linear ODE to a system of two first order linear ODEs
Orthogonality
Orthonormal bases
Gram-Schmidt orthonormalization
Least squares regression
Elementary Science

Grades 4-6
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

(Grades 7-8)
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

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

Geology (cont’d)
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
Meteorology (cont’d)
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
Contributories to the water in the ocean
Resources
Coriolis Effect
Major currents in the world and features
Waves
Tsunami characteristics

Astronomy (cont’d)
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
Biology

Chemistry of Life
- Atoms
- Important properties of water
- pH
- Molecular Movement, Osmosis and Diffusion
- Chemical Gradients
- Monomers and Polymers
- Carbohydrates, Lipids, Proteins, and Nucleic Acids
- Origins of life

Cell Structure and Function
- Prokaryotic and eukaryotic cells
- Structure and function of:
  - 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 Semi-permeability
- Active Transport
- Facilitated Diffusion
- Passive Transport
- Receptor Proteins
- Signaling Molecules
- Cell junctions

Cellular Energetics
- Autotrophs and Heterotrophs
- Change in free energy
- Exergonic and Endergonic Reactions
- Enzymes, Enzymatic Functions, and Enzymatic Pathways
- Coupled reactions, activation energy, and ATP
- Light-Dependent Reactions of Photosynthesis
- Calvin Cycle
- Chemosynthesis
  - Glycolysis
- Krebs Cycle
- Electron Transport Chain
- Fermentation

Cell Reproduction
- Ploidy
- Cell cycle
- 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.

Molecular Biology
- Famous genetic experiments-Hershey/Chase, Fred Griffith, Avery, Meselson/Stahl, Chargaff, and Watson/Crick.
- Semi-conservative replication
- DNA and genome structure
- Transcription
- Introns and mRNA splicing
- Translation and protein processing
Molecular Biology (cont’d)
- 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

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

Evolution and Phylogeny
- Common Ancestry
- Three-Domain Hypothesis
- 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, Nucleoid
- 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
Animal Form & Function (cont’d)
Homeostasis, Feedback Loops, and Hormones
Animal Behavior
Animal Reproduction
Endotherms and Ectotherms
Characteristics of the Following Taxa:
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
Spectrophotometry
Centrifugation
Serial dilution
Gel electrophoresis
Bacterial culturing
Chemistry

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-Boltzmann 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
Atomic and Molecular Structure (Cont’d)

- 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
Physics – Algebra-based

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

Dynamics (Cont’d)
- 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
Fluid Mechanics (Cont’d)
- 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
- Kirchhoff’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
- Lens’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
Optics (Cont’d)
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 processed
  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

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 processed
  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

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

Dynamics (Cont’d)
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
<table>
<thead>
<tr>
<th>Circular Motion and Rotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniform circular motion</td>
</tr>
<tr>
<td>Angular velocity and acceleration</td>
</tr>
<tr>
<td>Frequency and period</td>
</tr>
<tr>
<td>Vertical circular motion</td>
</tr>
<tr>
<td>Rotational kinematics</td>
</tr>
<tr>
<td>Moment of inertia</td>
</tr>
<tr>
<td>Rotational inertia</td>
</tr>
<tr>
<td>Parallel axis theorem</td>
</tr>
<tr>
<td>Rotational kinetic energy</td>
</tr>
<tr>
<td>Work and power in rotational motion</td>
</tr>
<tr>
<td>Torque</td>
</tr>
<tr>
<td>Torque and angular acceleration for a rigid object</td>
</tr>
<tr>
<td>Rotation of a rigid object around a fixed axis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gravitation (cont’d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallel combinations of identical or differing lengths of springs</td>
</tr>
<tr>
<td>Torsional pendulum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thermal Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat</td>
</tr>
<tr>
<td>Temperature</td>
</tr>
<tr>
<td>Mechanical Equivalent of heat</td>
</tr>
<tr>
<td>Heat Transfer and thermal expansion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equilibrium and Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotational equilibrium (torque)</td>
</tr>
<tr>
<td>Conditions for static equilibrium</td>
</tr>
<tr>
<td>Center of gravity</td>
</tr>
<tr>
<td>Stress, strain, and elastic moduli</td>
</tr>
<tr>
<td>Elasticity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fluid Mechanics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density and Pressure</td>
</tr>
<tr>
<td>Density</td>
</tr>
<tr>
<td>Specific gravity</td>
</tr>
<tr>
<td>Pressure as a function of depth</td>
</tr>
<tr>
<td>Pascal’s Law</td>
</tr>
<tr>
<td>Buoyancy – Archimedes’ Principle</td>
</tr>
<tr>
<td>Fluid dynamics</td>
</tr>
<tr>
<td>Fluid Flow continuity equation</td>
</tr>
<tr>
<td>Bernoulli’s Equation</td>
</tr>
<tr>
<td>Hydrostatics</td>
</tr>
<tr>
<td>Fluid Pressure</td>
</tr>
<tr>
<td>Viscosity and Turbulence</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gravitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal Gravitation</td>
</tr>
<tr>
<td>Gravitational Fields</td>
</tr>
<tr>
<td>Orbits</td>
</tr>
<tr>
<td>Kepler’s Laws of Planetary Motion</td>
</tr>
<tr>
<td>The Motion of satellites</td>
</tr>
<tr>
<td>Apparent Weight</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical and Magnetic Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatics</td>
</tr>
<tr>
<td>Electric charges</td>
</tr>
<tr>
<td>Conductors, insulators and semiconductors</td>
</tr>
<tr>
<td>Charging by conduction</td>
</tr>
<tr>
<td>Charging by induction</td>
</tr>
<tr>
<td>Coulomb’s Law</td>
</tr>
<tr>
<td>Electric fields</td>
</tr>
<tr>
<td>Electric Field Lines</td>
</tr>
<tr>
<td>Electric Dipoles</td>
</tr>
<tr>
<td>Electric Flux</td>
</tr>
<tr>
<td>Gauss’s Law</td>
</tr>
<tr>
<td>Rms speed of gas molecules</td>
</tr>
<tr>
<td>Avogadro’s number and Boltzmann’s constant</td>
</tr>
</tbody>
</table>

| Electric Potential Energy and Electric Potential Energies of simple harmonic motion |
| Graphs of simple harmonic motion   |
| Spring-mass system                |
| Resonance and sinusoidal external force |
| Damped oscillations               |
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

Electromagnetism (Cont’d)

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
Nature and Propagation of Light (Cont’d)

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

Modern Physics (Cont’d)

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 processed
  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
Anatomy & Physiology

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 Peyers 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
Microbiology

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

**Microbial Traits (Cont’d)**
- 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
Pathogenicity (Cont’d)
- 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
Organic Chemistry

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
Health Administration

Governance and Organizational Structure
- Organizational structures, key players, and their impact on health care delivery system
- Responsibility, authority, and accountability at each level of an organization
- Developing, implementing, and updating strategic plans
- Accreditation, regulatory, licensing, and certification programs

Quality and Performance Improvement
- Quality assessment programs and procedures
- Importance of regulation in health care organizations and its impact on continuous quality improvement
- Processes of continuous quality improvement, including the cost-quality paradigm

Law, Ethics, and Professionalism
- Government regulations and laws affecting the healthcare environment
- Relationship between healthcare law and healthcare ethics
- Application of moral, ethical, and legal principles in the delivery of healthcare
- Role of healthcare workers in protecting patient rights

Human Resources
- Assessing personnel needs
- Recruitment, selection, compensation, and training of personnel
- Evaluation of personnel including disciplinary actions

Management
- General management principles
- Role of leadership in promoting organizational effectiveness
- Management change theories and strategic management

Healthcare Finance, Technology, and Information Management
- Common financial tools, processes, and techniques used in healthcare
- Revenue cycle & reimbursement
- Financial considerations in the provision of health services (e.g. admitting and registration, case management/denials, credit and collections)
- Management and clinical information systems
- Electronic health records including legal and ethical issues

Healthcare
- Trends that are likely to shape the future of healthcare
- Role, structure, and funding of various health care organizations (e.g. physician’s office, walk-in clinic, hospital, ambulatory surgery center, rehabilitation center, etc.), community health services, and public health
- Patient relations
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

Nursing Pathophysiology (Cont’d)
- 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
- Otolarynychology
- 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
Nursing Pharmacology (Cont’d)

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
Nursing RN (Pediatrics)

• Systems and Associated Disorders
  Cardiovascular and circulatory
  Endocrine
  Excretory
  Gastrointestinal
  Immune
  Integumentary
  Musculoskeletal
  Nervous and sensory
  Reproductive
  Respiratory

• Health Assessments
  Communication with patients and family
  Diagnostic testing and evaluation
  Physical and developmental assessments

• Health Promotion
  Health promotion for pediatric patients
  Health promotion for the families of pediatric patients
  Influences of family on child health promotion
  Influences of socioeconomics, culture, and religion on child health promotion

• Nursing Care
  Chronic illness
  Cognitive and sensory impairment
  Community-based nursing care
  Disability
  End-of-life care
  Family-centered care

• Interventions
  Behavioral
  Community
  Family
  Health System

Physiological Safety

• Professional Performance
  Advocacy
  Ethics
  Evidence-based practice and research
  Law and regulation

Tutors must be knowledgeable about the fundamentals of nursing including nursing roles, settings, and health care trends.

Tutors must be knowledgeable of the following systems, and of associated disorders seen in all stages of childhood (newborn, infant, toddler, preschooler, school-age, and adolescent):
  Cardiovascular system
  Circulatory system
  Excretory system
  Respiratory system
  Nervous system
  Gastrointestinal system
  Endocrine system
  Reproductive system
  Musculoskeletal system
  Integumentary system
  Immune system
  Otolaryngology
  Ophthalmology

Tutors should be familiar with nursing care as it applies to pediatric patients in all of the following areas:
  Communication with the patient and family
  Pediatric nursing skills
  Physical and developmental assessments
  Diagnostic testing and evaluation
Health promotion for patients in all stages of childhood (newborn, infant, toddler, preschooler, school-age, and adolescent) and their families
Family, social, cultural, and religious influences on child health promotion
Community-based nursing care
Family-centered care at home and during hospitalization
Care of the child and family in the following contexts:
Chronic illness
Disability
Cognitive and sensory impairment
End-of-life care

Tutors should be familiar with pediatric variations of standard nursing practices and interventions, including those in the following areas:
- Pain assessment and management
- Altered fluid electrolyte or acid-base balance
- Medication administration
- Trauma and shock
- Pre- and post-surgery
- Infections
- Altered immunity
- Cancer
Medical Coding

Anesthesia
Medicine
Endocrine system
Nervous system
Urinary system
Integumentary system
Pathology
Laboratory
Hemic and lymphatic system
ICD-10-CM
Practice management
Medical terminology
Radiology
Musculoskeletal system
Digestive system
Evaluation and management
Respiratory system
Mediastinum and diaphragm
Male/female genital system
Maternity and delivery
Eye and ocular adnexa
HCPCS Level II
# Social Studies

## 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

## 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

## 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)

Adjectives
Adverbs
Antonyms
Compare/Contrast
Connotation
Contractions
Cross-Curricular
Reading/Writing
Denotation
Extract ideas from a variety of texts
Fiction
Grammar

Graphemes
Letter Writing
Literal Analysis
Literal Device
Literal Themes
Non-Fiction
Nouns
Paragraphs
Parts of Speech
Phonemes
Plays and Theater
Poetry
Point of View
Prefix/Suffix
Presentations
Pronouns
Punctuation and Capitalization
Reading Comprehension
Research Skills
Root Words
Sentence Structure
Synonyms
Verbs
Vocabulary
Writing Sentences

Middle Grades (Grades 7-8)

Characterization
Connotation
Content Area Literacy
Contextual Analysis
Denotation
Elements of a Story
Grammar
Interdisciplinary Subjects
Interpreting Graphs in Text
Literary Analysis

Literary Criticism
Literal Devices
Literal Themes
Modes of Persuasion
Narrative
Non-Fiction
Oral Communication
Plays and Theater
Point of View
Prose and Poetry
Punctuation and Capitalization
Reading Comprehension
Research Skills - Sources and Documentation
Sentence Structure
Subject Area Themes
Theme
Vocabulary

High School (Grades 9-12)

Argument
Copyright
Exposition
Expression through writing and presenting
Figures of Speech
Functional Texts
Grammar
Literary Analysis
Literary Criticism

Literary Devices
Literal Periods
Literal Themes
Logical Development of Ideas
Multimedia Communication
Oral Communication
Organizational Features of Text
Persuasion
Plays and Theater
Point of View
Presenting Media
Prose and Poetry
Punctuation and Capitalization
Reading Comprehension
Research Skills
Sources and Documentation
(APA/MLA/Chicago/Turabian)
Viewing Media
Visual Communication
Vocabulary
Literature

Literary Periods and Movements
- British Literature
- The Enlightenment
- Existentialism
- Medieval Literature
- Modernism
- Multi-Media
- Naturalism
- Post-Colonial Literature
- Post Modernism
- Realism
- Religious Texts
- Renaissance Literature
- Romanticism
- Transcendentalism
- Victorian Literature

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

Prose Non-Fiction
- Biography
- Creative Non-Fiction
- Essay
- News Media
- Non-Fiction

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

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

Literary Elements
- Character Development
- Character Types
- Narrative Point of View: First, Second, Third Person
- Plot Structure
- Setting: Geographic, Historical, Socio-Economic
- Stylistic Characteristics of Literature
- Thematic Characteristics of Literature
- Theme
- Versification

Literary Devices
- Allegory
- Irony: Verbal/Dramatic
- Figurative Language: Imagery
- Hyperbole and Synecdoche
- Mimesis/Metonymy
- Symbolism/Metaphor/Simile
Essay Writing

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
Functional Writing
Grammar
Interdisciplinary Writing
Journal Writing
Literary Analysis Writing
Narrative
Organization and Outlining Essays
Paragraphs
Persuasive Essay
Poetry Writing
Pre-writing Skills
Punctuation and Capitalization
Research Skills and Resources
Resume Writing
Source Documentation (APA/MLA/Chicago/Turabian)
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 Process
Writing Sentences
Writing Strategies
Writing Styles
College Essay Writing

- Argument
- Business Writing
- Citation and Documentation
- College and Job Application Writing
- Cover Letter Writing
- Creative Writing
- Descriptive Essay
- Editing and Proofreading
- Effective Content Analysis
- Elements of Composition
- Expository Essay
- Grammar
- Interdisciplinary Writing
- Journal Writing
- Lab Reports
- Literary Analysis Writing
- Narrative
- Oral Communication
- Organization and Outlining Essays
- Paragraphs
- Performance Pieces
- Persuasive Essay
- Poetry Writing
- Pre-writing Skills
- Punctuation and Capitalization
- Research Skills and Resources
- Resume Writing
- Source Documentation (APA/MLA/Chicago/Turabian)
- Speech Writing
- Story Writing
- Technical Writing
- Thesis Statements
- 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 Strategies
- Writing Styles
Primary Reading

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

(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 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 ESL

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
ESL

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
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
Introduction to Psychology

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
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
Research Methods

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

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

Race/Ethnicity (Cont’d)
- Inequalities
- Dominant Group
- Minority Group(s)
- Discrimination, Prejudice, Racism
- Homogeneity and Heterogeneity

Gender/Sex
- Biological Traits
- Gender Norms
- Gender Orders
- Masculinity/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
Introductory Accounting

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
Adjusting Entries

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
Intermediate Accounting

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
- Error corrections

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
Introductory Economics

Intro Microeconomics

Basic Supply and Demand (Algebra-Based)
- The Demand Curve and Quantity Demanded
- The Supply Curve and Quantity Supplied
- Equilibrium and Market Demand
- Shortages, Surpluses, and Subsidies
- Taxes, Regulations, Price Controls, Price Ceilings, and Price Floors
- Consumer Surplus and Producer Surplus
- Deadweight Loss
- Income Effect and Substitution Effect

Production Possibilities Frontier (Algebra-Based)
- Opportunity Cost
- Comparative Advantage and Absolute Advantage
- Gains and Losses from Trade
- Marginal Rate of Substitution

Consumer Theory (Algebra-Based)
- Price Elasticity of Demand
- Cross-Price Elasticity
- Price Elasticity of Supply
- Consumer Utility and Marginal Utility

Monopoly and Oligopoly Behavior (Algebra-Based)
- Monopoly Structure and Power
- Monopoly Price Determination and Monopoly
- Marginal Revenue
- Monopoly Deadweight Loss and Inefficiency
- Price Discrimination
- Monopolistic Competition
- Economies of Scale
- Oligopoly Structure and Power
- Cartels, Cheating, and Breakdown of Cartels

Perfect Competition and Managerial Economics (Algebra-Based)
- Profit Maximization
- Short-Run Costs and Lost-Run Costs
- Marginal Cost, Average Cost, Fixed Costs, Variable Costs, and Total Cost
- Marginal Profit, Average Profit, and Total Profit
- Industry Supply and Demand Curves
- Uncertainty and Sunk Costs

Game Theory
- Nash Equilibrium
- Prisoners’ Dilemma
- Application to Oligopoly and Competition

Behavioral Economics
- Market Efficiency, Market Inefficiency, and Market Failure
- Positive Externalities, Negative Externalities, and Solutions for Externalities

Behavioral Economics (Cont’d)
- Adverse Selection and Moral Hazard
- Public Goods and Private Goods
- The Tragedy of the Commons and the Coase Theorem

Introduction to the Labor Market
- Supply of and Demand for Labor
- Marginal Product of Labor
- Types of Wages
- Tournament Theory

Intro Macroeconomics

National Economic Models and Growth Theories
- Classical and Neoclassical Economic Models
- Keynesian and New Keynesian Economic Models
- Business Cycles and Shocks to Aggregate Demand
- Classical Growth Models
- Solow-Swan Growth Model

National Accounts, Price Indices, and the Circular Flow of Expenditures
- Gross Domestic Product and Gross Domestic Income
- Gross National Product and Gross National Income
- GDP Cycles, Real GDP, and Nominal GDP
- Economic Growth and Loss
- GDP Deflator
- Consumer Price Indices
- CPI Deflator

National Investment and Savings
- Marginal Propensity to Consume
- Marginal Propensity to Save
- The Multipliers

National Labor Market and Labor Force Participation
- Supply of and Demand for Labor
- National Labor Market Equilibrium
- Causes and Types of Unemployment
- Labor Force Participation Rates
- Full Employment Output

Fiscal Policy, Taxation, and Federal Spending
- Income Taxes and Corporate Income Taxes
- Balanced Budgets and Government Debt
- Transfer Payments and Federal Spending
- Insurance and Welfare

Monetary Policy and National Banking
- Fractional Reserve Banking System and Reserve Ratios
- The Power, Functions, and Tools of the Federal Reserve
Monetary Policy and National Banking (Cont’d)
   Levels of the Money Supply
   Positive and Negative Shocks to the Money Supply

Inflation and Quantity Theory of Money
   Types and Causes of Inflation
   The Phillips Curve
   Quantity Theory of Money

Introduction to Savings, Investment, and Finance
   The Market for Loanable Funds
   Supply of and Demand for Money
   The Role of Intermediaries and Types of Investments
   Stocks, Bonds, and Returns on Investment
   Simple and Compound Interest

Economic Ethics and Public Policy
   Cultural Goods, Paternalism, and Exploitation
   Fair and Equal Treatment

Economic Ethics and Public Policy (Cont’d)
   Immigration and Meddlesome Preferences
   Poverty, Inequality, and Distribution of Income
   Special Interest Groups

Political Economy
   Democracy, Growth, and Famine
   Median Voter Theorem
   Rational Ignorance and Voter Myopia
   Political Business Cycles

International Economics
   Balance of Payments
   Imports, Exports, and Trade Balance Behavior
   Tariffs and Protectionism
   Types of Exchange Rates
   Currency Speculation
Intermediate Macroeconomics

Capital, Investment, and the Market for Loanable Funds (Calculus-Based)
- Changes in and Factors of Capital Stock: Tobin’s Q
- Cost of Capital and the Demand for Investment
- The Market for Loanable Funds
- Keynesian Cross
- Marginal Product of Capital
- Types of Interest Rates

National Consumption and National Savings (Calculus-Based)
- Budget Constraints and Consumption Functions
- Income Shocks and Intertemporal Choice
- Measuring National Savings
- The Marginal Propensity to Consume, the Marginal Propensity to Consume, and the Multipliers

National Economic Models and Growth Theories (Calculus-Based)
- Classical and Neoclassical Economic Models
- Savings and Investment Economic Models
- Consumption and Savings Economic Models
- Keynesian and New Keynesian Economic Models
- Business Cycles
- Fischer Economic Models
- Stylized Facts
- Classical Growth Models
- Endogenous Growth Model
- Solow-Swan Growth Model

Endowment and Production Economies
- Production Economy Model and Production Economy Problems
- Effects of Change in Production Economies
- Production Equilibrium
- Endowment Economy Model and Endowment Economy Problems
- Endowment Equilibrium

Fiscal Policy and Government Debt
- Balanced Budgets, Tax Smoothing, and Stabilization Policies
- Government Deficits and Government Spending
- Government Transfer and Taxation Policies
- Traditional View of Government Debt
- Ricardian Debt and Ricardian Equivalence Theorem

National Accounts, Price Indices, and the Circular Flow of Expenditures
- Gross Domestic Product and Gross Domestic Income
- Gross National Product and Gross National Income
- GDP Cycles, Real GDP, and Nominal GDP
- Economic Growth and Loss
- GDP Deflator
- Consumer Price Indices
- CPI Deflator

National Labor Market and Labor Force Participation
- Supply of and Demand for Labor
- National Labor Market Equilibrium
- Causes and Types of Unemployment
- Labor Force Participation Rates
- Full Employment Output
- Labor/Leisure Choice
- Productivity Shocks
- Reservation Wages and Wage Determination

Aggregate Supply and Demand (Calculus-Based)
- The AS-AD Model
- Aggregate Demand and Long Run Aggregate Supply
- Shifting Aggregate Demand and Aggregate Supply and the AS-AD Equilibrium
- The IS-LM Model
- Shifting the IS-LM Curves and the IS-LM Equilibrium

Inflation, Quantity Theory of Money, and Theory of Liquidity
- Causes and Types of Inflation
- Inflation and Unemployment: The Phillips Curve
- Quantity Theory of Money
- Velocity of Money
- Levels of the Money Supply
- Positive and Negative Shocks to the Money Supply
- Theory of Liquidity

Monetary Policy and National Banking
- National Banking Systems, Tools, and the Federal Reserve
- The Role and Structure of Intermediaries
- The Fisher Effect and the Laffer Curve
- The Supply of and Demand for Money
- Money Neutrality, Money Non-Neutrality, and Monetary Equilibrium
- Rational and Irrational Expectations
- Welfare Improving Stabilization Policy
- Currency Printing and Seigniorage
- Ex Ante Outcomes, Ex Post Outcomes, Multiple Equilibria, and Animal Spirits
International Economics

- Imports, Exports, and Trade Policies
- Trade Balance Behavior
- Foreign Exchange Markets and Foreign Exchange Rates
- Currency Speculation and Signal Watching
- Balance of Payments
- Income Equality and Inequality: The Gini Coefficient and Autarky
- Poverty and Distribution of Income
- Immigration, Exploitation, and Paternalism
Intermediate Microeconomics

Consumer Theory (Calculus-Based)
- Budget Constraints and Consumer Surplus
- Consumer Choice and Demand
- Consumer Preferences and Utility
- Insurance, Lotteries, and Risk Aversion
- Compensating Variation and The Slutsky Equation
- Price Elasticity

Game Theory
- Nash Equilibrium, Mixed Strategies, and Dominant Strategies
- Sequential Games and Subgame Perfection
- Bayesian Equilibrium and Signaling\Separating Equilibrium
- Adverse Selection
- Threats, Commitments, and Credibility

Behavioral Economics
- Asymmetric and Incomplete Market Information
- Positive Externalities, Negative Externalities, and Market Failures
- Solutions for Negative Externalities and Markets for Positive Externalities
- Moral Hazard and the Principal-Agent Problem
- Warranties, Quality, Uncertainty, and Signaling
- Risks, Risk Preferences, and the Demand for Risky Assets
- Public, Private, and Network Goods
- Tragedy of the Commons and the Coase Theorem

Monopoly and Monopsony (Calculus-Based)
- Monopoly Structure and Power
- Monopoly Marginal Revenue and Monopoly Profit Maximization
- Price Discrimination
- Social Costs of Market Power
- Monopoly Advertising and Building
- Monopsony Structure and Power
- Tariffs, Price Ceilings, and Price Floors

Monopolistic Competition and Oligopoly (Calculus-Based)
- Market for Factor Inputs
- Structure and Power of Monopolistic Competition
- Oligopoly Structure and Power: Cournot and Stackelberg Models
- Price Competition
- Prisoner’s Dilemma and Price Setting
- Cartels and Breakdown of Cartels

Theory of the Firm and Managerial Economics (Calculus-Based)
- Cost Minimization and the Cost Function
- Profit Maximization and the Profit Function
- Consumption Duality
- Long-Run Costs and Short-Run Costs
- Long-Run Supply and Short-Run Supply
- The Shutdown Condition
- Economies of Scope and Economies of Scale
- Technology, Inputs, and Outputs
- Marginal Product of Capital

Labor Market (Calculus-Based)
- Supply of and Demand for Labor
- Managerial Wage Determination and Minimum Wage
- Total Labor and Marginal Product of Labor
- Labor Market Efficiency Wage Theory
- Labor Unions
Finance

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.
Cost Accounting

Activity Based Costing
Budgetary Planning and Control
Cost & Revenue concepts
Cost-Volume-Profit
Inventory Valuation
Job Order Costing
Manufacturing inventories
Motivating Employees to Perform
Process Costing
Ratio Analysis
Transfer Pricing
Working Capital Management
Managerial Accounting
Budgetary Planning and Control
Capital Budgeting
Capital Structure
Cost-Volume-Profit
Incremental Analysis
Job Order Costing
Manufacturing inventories
Motivating Employees to Perform
Process Costing
Product costs v. period costs
Ratio Analysis
Transfer Pricing
Working Capital Management
Tax Accounting

1120
Business Income and Deductions
Compensation
Corporate Formation, Reorganization, and Liquidation
Corporate Operations
Corporation: Nonliquidating Distributions
Dispositions of Partnership Interests
Entities Overview
Forming and Operating Non-Proftis
Forming and Operating Partnerships
Income and Exclusions
Individual Deductions
Individual Income Tax
Individual Income Tax Computation and Tax Credits
Intro to Tax
Investments
Property Acquisition and Cost Recovery
Property Dispositions
Retirement Savings and Deferred Compensation
S Corporations
State and Local Taxes
Tax Compliance
Tax Consequences of Home Ownership
Tax Planning
Transfer Taxes and Wealth Planning
U.S. Taxation of Multinational Transactions

(Back to Business)
Principles of Management

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
Business Law

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
MS Access

Proficiency with Access 2010 required, preferably older and newer versions as well. English version required.

Database Relations and Development
- Database Terminology
- Primary and Secondary Keys - Creating Relationships
- Enforcing Referential Integrity in Key Relationships
- Creating a Database
- Creating a Database from a Template

Tables
- Types of Tables within a DB
- Creating Tables
- Creating Linked Tables
- Changing Tables
- Entering New Data
- Adding Descriptions
- Indexing a field
- Data Validation
- Hiding Fields
- Validating and Managing Records within a Table - Adding and Updating

Queries
- Using Queries within a Database
- Running a Query
- Creating a Simple Query
- Creating a Crosstab Query
- Creating a Parameter Query
- Operations and Expressions in a Query
- Creating an Aggregate Query
- Create an Action Query
- Create a Multiple Table Query
- Saving Queries

Forms
- Using Forms within a Database
- Creating a Blank Form
- Creating a Form from a Template
- Saving Forms
- Adding and Moving Form Controls
- Managing Labels
- Adding Sub-Forms
- Working with Data on Forms
- Modifying Print Settings
- Inserting backgrounds, headers, and footers

Reports and Reporting Tools
- Creating a New Report
- Creating a Report Based on a Query
- Creating a Report Using a Wizard
- Selecting Summary options
- Group and Sort Report Fields
- Report Text Box Controls
- Modify Data Sources
- Inserting headers, footers, and applying themes

Formatting Reports

Macros
- Using Macros
- Understanding Security
- Creating a Macro
- SubMacros
- Handling Macro Errors

Importing/Exporting
- Creating a DB by importing
- Importing Data into Tables
- Exporting Data

Data Analysis
- Transforming Data
- Calculations and Dates
- Parametrized Queries
- Entering SQL
- Subqueries and Aggregation
MS Excel

Proficiency with Excel 2010 required, preferably older and newer versions as well. English version required.

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.
Panels 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 and newer versions as well. English version required.

**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
Proficiency with PowerPoint 2010 required, preferably older and newer versions as well. English version required.

- 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: Those wanting to tutor MS Windows must be proficient with BOTH the user side of Windows and the admin side of Windows.

Windows Installation and Setup
- Preparing for Installation
- Adding/Managing User Accounts
- Display Settings & Personalization Options
- Power Settings
- Privacy / Security Settings
- Accessibility Options

File and Folder Operations
- Desktop, Start Menu & Taskbar
- Navigating with File Explorer
- Creating Folders and Saving Files
- Move, Copy, Delete, and Rename Files/Folders
- Folder Views and Settings
- File/Folder Searches
- Managing Hard Drives and Storage - Local, Removable, and Cloud

Windows Utilities
- Desktop Accessories
- Control Panel
- Backup and Recovery Tools
- Security - Antivirus, Antimalware, and Firewall Tools
- Windows Update

Basic Software & Hardware Management
- Windows Apps & Microsoft Store
- Adding/Removing Programs
- Adding/Removing/Managing Printers
- Adding/Removing/Managing Bluetooth Devices
- Locating and Running Programs

Accessing the Internet
- Connecting to a Network - Ethernet & WiFi
- Accessing the Internet with Internet Explorer, Microsoft Edge
- Email and the Mail app
- Searching the Internet/Default Search Engine

Basic Troubleshooting
- Viewing System Information
- Task Manager - Monitoring System Performance
- Windows Troubleshooter
- Safe Mode
**Principles of CS**

*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/printIn)
- 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
C++

**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
Web Design

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

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

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
French

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 compose, 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

**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
d-a- & 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

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