Pacesetter Education Press *and the* Pace Learning Curriculum

2026 Scope and Sequence

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Reading At Your Own Pace

Lesson 100 – Introduction to Homonyms

- Recognizing and using homonyms, words that sound alike but have different meanings

Lesson 105 – Introduction to Synonyms

- Recognizing and using synonyms, words that are the same or almost the same in meaning
- Recognizing the synonym pairs: big, large; remain, stay; beside, next to; raise, lift; finish, complete; actually, really; close, shut; cozy, comfortable; tiny, little; collect, gather; tiny, small; exchange, trade; mad, angry; purpose, aim; cent, penny; winner, champion; listen, hear; tap, knock; begin, start; trash, garbage; sea, ocean; couples, pairs; gift, present; awful, terrible; shore, beach; applaud, clap; pitch, throw; stare, watch; foolish, silly; order, command; soil, dirt; pattern, design; speak, talk; twist, turn

Lesson 110 – Introduction to Antonyms

- Recognizing and using antonyms, words that are opposite in meaning
- Recognizing antonym pairs: hot, cold; true, false; wet, dry; day, night; long, short; hard, easy; tiny, huge; silent, noisy; wide, narrow; begin, end; fancy, plain; happy, sad; heavy, light; bored, excited; square, round; early, late; proud, ashamed; right, wrong; agree, disagree; good, bad; admit, deny; add, subtract; find, lose; on, off; cheap, expensive; twist, turn; winner, champion; listen, hear; rude, polite

Lesson 121 – Prefixes: Unit 1

- Defining a word based upon its root and prefix
- Recognizing the meaning of the following prefixes: re-, pre-, post-, mis-, dis-, sub-, il-, super-, im-, uni-, in-, bi-, ir-, tri-, non-, multi-, un-, semi-

Lesson 122 – Prefixes: Unit 2

- Defining a word based upon its root and prefix
- Recognizing the following prefixes: over-, auto-, under-, fore-, extra-, com-, con-, in-, mal-, en-, out-, be-, de-, ex-, co-, dis-, anti-, mono-, pro-, counter-

Lesson 131 – Suffixes: Unit 1

- *Using a word's suffix to help define* the word
- Recognizing the following suffixes: -ible, -able, -hood, -ness, -dom, -ship, -ment, -ful, -fully, -er, -or, -ent, -ant, -ist, -ary, -ly, -ee

Lesson 132 – Suffixes: Unit 2

- Using a word's suffix to help define the word
- Recognizing meaning of the suffixes: -ic, -ion, -sion, -ish, -en, -ive, -al, -less, -ous, -ize, -yze

Lesson 141– Words in Context: Unit 1

- Explaining the concept of words in context
- Defining a word from its general context
- Defining a word from prior knowledge
- Defining from information following example clue
- Defining from contrast clues/phrases
- Defining from comparison clues

Lesson 142 – Words in Context: Unit 2

- Explaining the concept of words in context
- Defining a word from a stated definition
- Defining a word from an explanation

Lesson 150 – Synonyms and Antonyms

- Recognizing and using synonyms, words that are the same or almost the same in meaning
- Recognizing and using antonyms, words that are the opposite in meaning

Lesson 160 – Advanced Homonyms

- Recognizing and using homonyms, words that sound alike but have different meanings

Lesson 165 – Figures of Speech

- Recognizing and using figures of speech, similes, and metaphors

Lesson 200 – Introduction to Character

- Understanding character feeling, motives, traits

Lesson 205 – Cause and Effect

- Identifying clue word and phrases that indicate a cause/effect relationship
- Identifying a when clause
- Identifying an implied cause or effect
- Identifying causes and effects in a causal chain

Lesson 210 – Fact and Opinion

- Defining fact and opinion
- Identifying value words
- Distinguishing between a statement of fact and a statement of opinion including a value word
- Identifying a statement including fact and opinion
- Identifying an opinion as statement about the future
- Identifying as an opinion a statement of someone's personal judgment or belief
- Identifying words/phrases that signal an opinion

Lesson 215 – Conclusions and Generalizations

- Defining conclusion and generalization
- Comparing conclusions and generalizations from similar contexts
- Drawing conclusions from a paragraph
- Making generalizations from a paragraph
- Drawing conclusions and generalizing from evidence

English At Your Own Pace

Lesson 100 – Singular and Plural Nouns

- Forming plural of nouns following general rule
- Forming the plural of nouns ending in f
- Forming the plural of nouns ending in o
- Forming the plural of nouns ending in s
- Forming the singular possessive
- Forming the plural possessive
- Forming separate and joint possessives

Lesson 105 – Pronouns

- Defining pronoun
- Explaining gender as related to pronouns
- Explaining number as related to pronouns
- Explaining -self and -selves pronouns
- Explaining different forms of pronouns
- Explaining relative pronouns

Lesson 110 – Verbs

- Defining verb
- Explaining number and tense
- Explaining linking verbs
- Stating and using the principal parts of irregular verbs

Lesson 115 – Adjectives and Adverbs

- Defining adjective
- Explaining predicate adjectives
- Defining adverb
- Explaining comparative/superlative adjectives

Lesson 120 – Possessives

- Defining possessive
- Using apostrophes to form noun possessives
- Forming singular possessive of nouns
- Forming plural possessive of nouns
- Explaining possessive pronouns

Lesson 200 – Sentence Recognition

- Defining and identifying complete sentences
- Defining and identifying sentence fragments
- Defining and identifying run-on sentences
- Correcting a run-on sentence

Lesson 205 – Introduction to Sentence Combining

- Combining sentences by combining predicates
- Combining sentences by combining subjects
- Combining sentences by adding a word/phrase
- Combining sentences by adding a clause

Lesson 210 – Combining Sentences

- Combining sentences by combining predicates
- Combining sentences by combining subjects
- Combining sentences by adding a phrase/clause
- Combining sentences by using signal words

Lesson 215 – Introduction to Paragraphs

- Defining paragraph
- Defining topic sentence
- Identifying the parts of a paragraph

Lesson 220 – Paragraph Development

- Recognizing a topic sentence
- Logically organize sentences in a paragraph

Lesson 225 – Sentence Sequence

- Arranging sentences in logical sequence or time order
- Arranging sentences that describe events using clue words indicating time

Lesson 300 – Capitalization

- First word of a sentence
- First word of a direct quote
- The pronoun, I
- Proper nouns, proper adjectives
- Days of the week and months of the year
- Specific days, months, and special events
- Personal, professional, and family titles
- Names of religious, racial, and political groups Names of organizations and institutions
- Names of directions as place names

- Specific regions, nationalities, and ethnicities
- Initials in a name
- Titles: books, songs, poems, movies, plays
- Names of historic periods, events, documents, and memorials

Lesson 311 – Commas: Unit 1

- Using a comma in a date
- Using a comma to separate items in a series
- Using a comma after an introductory word/phrase
- Using a comma in a compound sentence
- Using a comma in a street address

Lesson 312 – Commas: Unit 2

- Using a comma to set off a direct address
- Using a comma to separate a direct quotation
- Using commas to set off a phrases and clauses that rename or describe a noun
- Using commas to set off interrupting word or phrase
- Using commas to follow yes or no when either word starts a sentence

Lesson 315 – End Marks

- Identifying when to correctly use a period
- Identifying when to correctly use an exclamation point
- Identifying when to correctly use a question mark

Lesson 320 – Quotation Marks

- Distinguishing between direct and indirect quotes
- Punctuating direct quotes

Lesson 325 – Colons and Semicolons

- Using a colon to link a series
- Using a colon after the following or as follows
- Using a colon to separate a nonessential phrase
- Using a colon to separate hours and minutes expressed as figures
- Using a colon to join two sentences when the second explains the first
- Using a colon after a business letter greeting
- Using a semicolon to link complete thoughts
- Using a semicolon with commas to separate items in a series

Math At Your Own Pace

Lesson 100 – Introducing Whole Numbers

- Writing in words cardinal numbers from one to one thousand
- Writing in words two-, three-, and four-digit cardinal numbers
- Placing the comma correctly in cardinal numbers of four or more digits
- Writing the cardinal number that corresponds to the number written in words
- Writing ordinal numbers by adding the suffix -st, -nd, -rd, or -th
- Writing in words ordinal numbers

Lesson 105 – Adding Whole Numbers

- Adding two or more whole numbers, arranged vertically and horizontally
- Identifying the addend, the plus sign, and the sum in an addition problem
- Identifying the place value of digits in a two-, three-, four-digit number

Lesson 110 – Subtracting Whole Numbers

- Identifying the minuend, subtrahend, and difference in a subtraction problem
- Subtracting whole numbers of one and two digits, arranged vertically/horizontally, without borrowing
- Checking the answer to a subtraction problem by adding the difference and the subtrahend
- Subtracting whole numbers of three or more digits, arranged vertically/horizontally, without borrowing
- Subtracting whole numbers of one and two digits, arranged vertically and horizontally, with borrowing
- Subtracting whole numbers of three or more digits, arranged vertically and horizontally, with borrowing

Lesson 115 – Multiplying Whole Numbers

- Multiplying a one-, two-, three- or four -digit whole number by a one-digit whole number, arranged vertically and horizontally, with and without carrying
- Multiplying a one- or two-digit whole number by a two-digit whole number, arranged vertically and horizontally, with and without carrying

Lesson 120 – Dividing Whole Numbers

- Identifying the divisor, dividend, quotient, and remainder in a division problem
- Writing division problems using both signs
- Dividing two-digit dividend by one-digit divisor
- Checking the answer to a division problem by multiplying the quotient by the divisor and adding the remainder
- Dividing three-digit dividend by one-digit divisor
- Dividing three-, four-, and five-digit dividends by one-digit divisor
- Dividing two-digit dividend by two-digit divisor
- Dividing dividend of more than two digits by two- and three-digit divisor

Lesson 200 – Introducing Fractions

- Identifying fractions
- Identifying the numerator/denominator of a fraction
- Identifying proper and improper fractions
- Identifying fractions that equal one
- Identifying mixed numbers
- Changing whole number to fraction that equals one

Lesson 205 – Reducing Fractions

- Reducing a fraction with a large nominator and denominator to its lowest terms.
- Identifying even and odd numbers

Lesson 210 – Finding the Lowest Common Denominator

- Converting two or more fractions with different denominators into common denominator
- Multiplying denominators of fractions with two or more different denominators to determine the Lowest Common Denominator.
- Multiplying to find the correct numerators

Lesson 215 – Changing Improper Fractions to Mixed Numbers

- Using division to change an improper fraction to a mixed number

Lesson 220 – Changing Mixed Numbers to Improper Fractions

- Using multiplication and addition to change a mixed number to an improper fraction

Lesson 225 – Adding Fractions

- Adding two or more proper fractions of a common denominator, arranged vertically and horizontally
- Adding two or more proper fractions having unlike denominators, arranged vertically and horizontally
- Adding a combination of proper fractions, whole numbers, and mixed numbers, arranged vertically and horizontally
- Changing a sum having an improper fraction to a sum that does not have an improper fraction
- Reducing all answers to the lowest terms.

Lesson 230 – Subtracting Fractions

- Subtracting proper fractions of a common denominator
- Subtracting proper fractions having unlike denominators
- Subtracting mixed numbers whose fractions have a common denominator
- Subtracting mixed numbers whose fractions have unlike denominators
- Subtracting proper fraction from whole number
- Subtracting mixed number from whole number
- Subtracting a fraction or a mixed number from a mixed number by borrowing

Lesson 235 – Multiplying Fractions

- Multiplying two proper fractions
- Multiplying a proper fraction and whole number
- Multiplying a proper fraction and mixed number
- Multiplying two mixed numbers
- Multiplying more than two fractions at once

Lesson 240 – Dividing Fractions

- Enumerating the steps for dividing fractions
- Dividing proper fractions
- Dividing a whole number by a proper fraction
- Dividing a proper fraction by a whole number
- Dividing a mixed number by a proper fraction
- Dividing by a mixed number

Lesson 245 – Word Problems with Fractions

- Identifying the correct operation for solving a given word problem involving fractions
- Identifying clue words for addition in word problems involving fractions
- Addition word problems involving fractions
- Identifying clue words for subtraction in word problems involving fractions
- Subtraction word problems involving fractions
- Identifying clue words for multiplication in word problems involving fractions

- Multiplication word problems involving fractions
- Solving word problems involving fractions

Lesson 300 – Finding Averages

- Using addition and division to find averages

Lesson 305 – Problems Involving Time

- Converting units of time: minutes to hours to days, to weeks, to months, to years
- Calculating ending time
- Calculating elapsed time
- Calculating starting time
- Problem solving with the 12-hour clock

Lesson 310 – Standard System of Measurement

- Converting linear measurements: inches-feet-yards
- Converting volume measurements: cups to pints to quarts to gallons
- Converting weight measurements: ounces-pounds
- Identifying equivalents of linear, weight, and volume measurements
- Solving problems involving measurement

Lesson 315 – Metric System of Measurement

- Converting larger metric units to smaller ones and smaller metric units to larger ones
- Converting linear measurements following conversion rule: millimeters to centimeters to meters to kilometers
- Converting weight measurements following conversion rule: grams to kilograms
- Converting various volume/capacity measurements following conversion rule: milliliters to liters

Lesson 400 – Introduction to Shapes and Sizes

- Identifying matching shapes and sizes
- Identifying shapes and sizes by matching halves

Lesson 405 – Perimeter

- Finding the perimeter of a polygon
- Solving word problems involving perimeter

Lesson 410 – Plane Geometric Figures

- Identifying plane figures
- Identifying horizontal, vertical, parallel, intersecting, and perpendicular lines
- Identifying closed figures: triangles, squares, rectangles, and circles

Lesson 415 – Solid Geometric Figures

- Identifying three-dimensional figures: rectangular solid, cube, cylinder, cone, sphere, and pyramid

Accelerated Learning: Reading

Standard I – Vocabulary Skills

Lesson 101 – Prefixes: Unit 1

- Defining a word based upon its root and prefix
- Recognizing the meaning of the following prefixes: un-, de-, re-, ex-, pre-, anti-, post-, pro-, inter-, ante-, intra-, peri-, in- (meaning in), mis-, dis-, il-, im-, in-, non-, ir- (meaning not), sub-, circum-, super-, trans-

Lesson 102 – Prefixes: Unit 2

- Defining a word based upon its root and prefix
- Recognizing the meaning of the following prefixes: uni-, en-, bi-, in-, tri-, be-, mono-, semi-, poly-, by-, multi-, ultra-, fore-, hyper-, con-, com-

Lesson 103 – Prefixes: Unit 3

- Defining a word based upon its root and prefix
- Recognizing the meaning of the following prefixes: over-, tele-, under-, audio-, extra-, pseudo-, out-, hypo-, on-, aqua-, off-, ambi-, auto-, counter-, geo-, ab-, bio-, ad-

Lesson 111 – Suffixes: Unit 1

- Distinguishing between prefix, root, and suffix
- Using a word's suffix to help define the word
- Recognizing the meaning of the following suffixes: -s, -es, -er, -or, -ed, -ee, -ing, -ant, -ent, -ible, -able, -ist, -hood, -ary, -ness, -ian, -dom, -age, -ship, -ward, -ful, -cy, -ly, -ette, -y, -ment, -let

Lesson 112 – Suffixes: Unit 2

- Using a word's suffix to help define the word
- Recognizing the meaning of the suffixes: -ic, -ion, -sion, -ish, -en, -ive, -al, -less, -ous, -ize, -yze
- Identifying and correctly spelling open, hyphenated, and closed compound words

Lesson 120 – Synonyms, Antonyms and Figures of Speech

- Defining a word from a synonym clue
- Defining a word from an antonym clue
- Explaining figures of speech
- Identifying figures of speech in context
- Explaining a sentence or paragraph based upon a figure of speech

Lesson 125 – Definitions and Explanations

- Explaining the concept of words in context
- Defining a word from a stated definition
- Defining a word from an appositive phrase
- Defining from information following a dash/colon
- Defining a word from information following a signal word or phrase

Lesson 130 – Clue Words and Phrases in General Context

- Homonyms and homophones in context
- Substituting definitions in context
- Defining a word from paragraph-level context
- Defining a word from an example clue
- Defining a word from a contrast clue
- Defining a word from a comparison clue
- Understanding that words gather meaning from context and carry connotation and denotation

Lesson 135 – Word Classifications

- Assigning words to general categories, such as animals, rivers, etc.
- Distinguishing a general category word from an example word, such as pet and dog
- Stating the general category for lists of example words
- Identifying the correct example word for a given general category

Lesson 140 – Word Analogies

- Explaining the concept of word analogies
- Completing time/location analogies
- Completing synonym analogies
- Completing antonym analogies
- Completing whole/part analogies

Standard II – Comprehension Skills

Lesson 201 – Reading Strategies: Unit 1

- Determining the topic through pre-reading
- Identifying main topics, subtopics, and details to include in an outline of a passage
- Locating key word, phrase, or detail by scanning
- Determining the organizational pattern (time order, listing, cause and effect, comparison/contrast)
- Identifying the clue words or phrases that help to determine the organizational pattern
- Applying a variety of strategies to aid in the comprehension of text, e.g., prediction, phonics, structural analysis
- Using types, structures, and features of the text--for example, headings, subheadings, examples--to aid in comprehension

Lesson 202 – Reading Strategies: Unit 2

- Identifying the organizational pattern (time order, listing, cause and effect, comparison/contrast) of a passage
- Identifying additional information that is irrelevant to a given passage
- Identifying additional information that is relevant, or useful, to a given passage
- Identifying a logical conclusion or outcome of a passage
- Identifying the appropriate reading strategy to use to better understand a passage
- Restating, summarizing, or paraphrasing information
- Recognizing statements that adequately summarize a passage
- Analyzing passages and applying strategies such as summarizing

Lesson 210 – Sequence of Events

- Arranging a list of events in the order in which they occur in a passage
- Identifying time clue words in a passage
- Using time clue words to determine the sequence of events in a passage
- Identifying the correct sequence of events using logic, clue words, or passage order
- Using time clue phrases to identify the correct sequence of events of a passage
- Identifying implied events as part of the sequence of events in a passage
- Defining and identifying chronological order, spatial order, and order of importance in a piece of writing

Lesson 221 – Main Ideas and Supporting Details: Unit 1

- Identifying the topic and limit in a sentence
- Explaining the topic sentence, details, and concluding sentence in a paragraph
- Identifying the sentence from a group of sentences that is the best topic sentence
- Defining general to particular paragraph
- Defining general to example paragraph
- Defining particular to general paragraph
- Identifying the main idea in a paragraph

Lesson 222 – Main Ideas and Supporting Details: Unit 2

- Defining whole-to-parts paragraph
- Identifying the main idea and details in whole-to-parts paragraphs
- Defining question-to-answer paragraph
- Defining cause/effect paragraph
- Defining definition paragraph
- Defining comparison/contrast paragraph
- Defining process paragraph
- Defining implied main idea
- Identifying the main idea and supporting details in paragraphs of various patterns

Lesson 223 – Main Ideas and Supporting Details: Unit 3

- Explaining how a title may be too broad/narrow
- Selecting the best title for a paragraph
- Defining thesis statement in an essay
- Identifying the main idea, best title, and supporting details in passages longer than two paragraphs
- Identifying the main idea and supporting details in consumer information passages
- Identifying stated or implied main idea in business letters and memoranda

Lesson 230 – Conclusions and Generalizations

- Conclusion, prior knowledge, available evidence
- Identifying the correct conclusion based upon evidence in a passage
- Identifying synonyms for the word conclusion
- Synthesizing information from multiple sources to draw conclusions
- Drawing conclusions about information synthesized from multiple sources
- Defending conclusions rationally
- Defining generalization
- Distinguishing generalization and example
- Identifying all-inclusive and all-exclusive words
- Identifying words used to qualify generalizations, and accurate generalizations

Lesson 235 – Directions and Instructions

- Recalling the five steps for reading and following directions
- Following directions in a recipe
- Following directions for school assignments

- Following directions for school/work assignments
- Following directions to a location
- Following directions for practical, real-life activities
- Using time clue words to follow directions
- Using drawings to follow directions

Lesson 241 – Cause and Effect: Unit 1

- Identifying clue word and phrases that indicate a cause/effect relationship
- Identifying the appropriate cause given effect
- Identifying the appropriate effect given a cause
- Identifying an implied cause
- Identifying an implied effect
- Identifying causes and effects in a casual chain

Lesson 242 – Cause and Effect: Unit 2

- Identifying effects in an informational passage
- Identifying effects in a short story
- Identifying the causes and effects in a causal chain within informational and story passage

Lesson 251 – Fact and Opinion: Unit 1

- Defining fact and opinion
- Identifying value words
- Distinguishing between a statement of fact and a statement of opinion including a value word
- Identifying as an opinion a statement including a fact and an opinion
- Identifying as an opinion a statement referring to the future
- Identifying as an opinion a statement of someone's personal judgment or belief
- Identifying words and phrases that signal an opinion
- Distinguishing between statements of fact and opinion in a passage

Lesson 252 – Fact and Opinion: Unit 2

- Defining propaganda
- Identifying biased words or phrases
- Identifying words that evoke positive, negative, and neutral emotional responses
- Identifying statements that are neutral, positively slanted, or negatively slanted
- Identifying words that show bias
- Identifying the type of propaganda – slanted words, important information left out, join the crowd, appeal to individuality, testimonial, words of an authority – used in a passage
- Recognizing reliable information in reading.
- Recognizing valid information in reading.
- Evaluating messages and effects of mass media

Lesson 260 – Writer's Purpose

- Characteristics of writing to inform
- Characteristics of writing to instruct
- Characteristics of writing to entertain
- Characteristics of writing to critique or evaluate
- Recognizing persuasive devices and techniques, such as loaded language, sarcasm, satire
- Characteristics of writing to request
- Defining tone of the writer
- Identifying language used to confuse or inform, repel or persuade, inspire or enrage, etc.
- Identifying the purpose of a passage
- Identifying the intended audience for a passage
- Identifying persuasive techniques – mudslinging, either/or argument, circular argument – that result in invalid arguments
- Recognizing fallacies of argument and judge strength of argument
- Explaining how the use of language in a selection affects reader response

Standard III – Abbreviations and Contractions

Lesson 300 – Abbreviations: Time

- Abbreviating months of the year
- Abbreviating days of the week
- Abbreviating ante meridiem and post meridiem
- Abbreviating names of U.S. time zones
- Abbreviating words for time measurement
- Abbreviating anno Domini and before Christ
- Common Era and Before Common Era
- Understanding the similarity between BC/AD and BCE/CE

Lesson 305 – Abbreviations: Measurements

- Abbreviating customary units for length
- Abbreviating customary units for weight
- Abbreviating customary units for volume
- Abbreviating basic metric units for length, weight, and volume

- Explaining the prefixes kilo-, milli-, and centi-
- Abbreviating the names of metric units containing kilo-, milli, and centi-
- Abbreviating Fahrenheit and Celsius
- Abbreviating miles per hour and miles per gallon

Lesson 310 – Abbreviations: Locations

- Abbreviating states (common and postal)
- Abbreviating United States and United States of America
- Abbreviating words meaning street or road using postal and common abbreviations
- Abbreviating directions (compass points)

Lesson 315 – Abbreviations: Miscellaneous and Symbols

- Abbreviating personal titles
- Abbreviating professional titles
- Abbreviating official titles
- Abbreviating company, corporation, incorporated
- Abbreviating chapter(s) and page(s)
- Abbreviating frequently used words and phrases such as etc., e.g., and vs.
- Identifying common symbols
- Defining acronym
- Differentiating between acronyms and other abbreviations

Lesson 320 – Abbreviations: Help Wanted Ads

- Identifying abbreviation for words per minute
- Identifying abbreviations for experience necessary and experience required
- Identifying abbreviations for full-time and part-time
- Identifying abbreviations of words regarding pay
- Identifying abbreviations of words regarding company benefits
- Identifying abbreviations of words regarding descriptions of job titles
- Identifying abbreviation for Equal Opportunity Employer
- Identifying the abbreviation of words regarding employment agencies

Lesson 325 – Contractions

- Defining contraction
- Identifying contractions formed from a personal pronoun and a verb
- Identifying from context the meaning of a personal pronoun + verb contraction that has more than one meaning
- Differentiating between they're, their, and there
- Differentiating between you're and your
- Differentiating between it's and its
- Differentiating between whose and who's
- Identifying contractions formed from an indefinite pronoun and a verb
- Identifying contractions formed from someone's name and a verb
- Identifying contractions formed from an adverb and a verb
- Identifying contractions formed from a verb plus not
- Identifying can't and won't as contractions that leave out more than one letter

Standard IV – Reference Skills

Lesson 400 – Sources of Information

- Defining reference sources
- Defining periodicals
- Explaining how information is arranged in a telephone directory
- Identifying information in the yellow pages of a telephone directory
- Defining dictionary and thesaurus
- Defining encyclopedia
- Defining card catalog and Readers' Guide to Periodical Literature
- Defining atlas
- Defining almanac
- Defining handbook
- Defining manual
- Defining plagiarizing

Lesson 405 – Guide Words

- Alphabetizing words beginning with different letters
- Alphabetizing words beginning with the same letter
- Alphabetizing a list of words beginning with the same first two letters
- Alphabetizing a list of words beginning with the same first three letters
- Alphabetizing a list of words beginning with the same first four letters

- Alphabetizing following the rule “nothing comes before something”
- Alphabetizing following the rule “ignore hyphens, apostrophes, and spaces”
- Alphabetizing a list of people’s names
- Alphabetizing a list of literary titles
- Defining guide words
- Selecting words to be found on a page having specified guide words
- Selecting words to be found in a specified volume of a set of books
- Using guide words located in card catalogs

Lesson 410 – Dictionaries

- Defining unabridged and abridged dictionary
- Defining guide words
- Identifying main entries on a page from a dictionary
- Identifying the number of syllables
- Identifying the sound of a letter in a phonetically respelled word as shown by a pronunciation key
- Identifying the part of speech of a main entry word in a dictionary
- Identifying other forms of main entry words in a dictionary
- Identifying the correct definition based upon a given sentence
- Identifying the synonym of a main entry word in a dictionary
- Identifying the source language and source word of a main entry word in a dictionary

Lesson 415 – Encyclopedias:

- Defining encyclopedia
- Selecting words to be found in specified volume of a set of books
- Explaining how to read an entry in an encyclopedia index
- Finding a topic in the index by looking up a related word or a more general word
- Explaining cross reference
- Identifying a main entry, cross reference, and details in entries from a section of an encyclopedia

Lesson 420 – The Library

- Defining card catalog, Readers’ Guide to Periodical Literature, and computerized catalog system
- Explaining how to read author, subject, title cards
- Identifying information on an example author, subject, and title card
- Explaining cross reference card
- Explaining call number
- Explaining how to search a computerized catalog system for information about a book

Lesson 430 – Using Books

- Identifying information on the title page
- Identifying information on the copyright page
- Defining preface
- Explaining how to read the table of contents
- Defining appendix
- Defining glossary
- Identifying the parts of a bibliographic entry for a book and a magazine
- Identifying information in the index of a book

Lesson 440 – Diagrams and Graphs

- Identifying the characteristics of a diagram
- Identifying specific information in a diagram
- Identifying specific information in a pictograph
- Determining a trend based upon a pictograph
- Identifying specific information in a bar graph
- Identifying specific information in a line graph
- Identifying information in a comparison graph
- Identifying specific information in a circle graph

Lesson 445 – Tables and Charts

- Identifying methods for reading a table or chart
- Identifying information in a table
- Identifying information in footnotes in a table
- Identifying information in mileage charts
- Identifying information in charts
- Identifying information in a process chart

Lesson 451 – Maps: Unit 1

- Enumerating the parts of a map: title, legend, compass rose, distance scale
- Identifying specific information on a given map
- Identifying intermediate directions on compass rose
- Identifying a specific location on a map using grid coordinates
- Determining distance between two points on a map using the distance scale

Lesson 452 – Maps: Unit 2

- Characteristics of physical and political maps
- Identifying information on a time zone map
- Identifying information on an area code map
- Identifying information on a weather map
- Identifying information on a population map
- Identifying information on a products map
- Identifying information on a transportation map
- Identifying information on a contour map
- Identifying specific information on a global map

Lesson 460 – Using Information Sources

- Identifying the appropriate research reference source in which specific information is found
- Identifying the appropriate everyday reference source in which specific information is found
- Locating, gathering, analyzing, and evaluating information to be used in real world tasks.
- Locating, gathering, analyzing, and evaluating information to be used for self-improvement.
- Reading and analyzing material written for a general audience to meet personal goals, e.g., individual
- Analyzing the validity and reliability of primary source information and using the information appropriately.
- Doing research using both print materials and online resources
- Recognizing and using organizational features of printed text, other media, and electronic information (parts of a text, citations, endnotes, bibliographic references, microprint, laser discs, hypertext, keyword searches)
- Locating and evaluating information sources (print materials, databases, references, Internet information, electronic reference works, community and government data, television and radio resources, audio and visual materials)

Lesson 465 – Using the Internet

- Using the library, the internet, and other sources as information-gathering tools to develop informed opinions and make decisions
- Explaining how to use internet library sources and search engines to find specific books
- Using electronic media for language arts purposes
- Using the internet appropriately for information gathering and problem solving
- Explaining different types of websites and credibility
- Explaining how to document a website
- Explaining how to use different types of indexes or information centers on the internet
- Explaining the dangers of plagiarizing with the internet

Lesson 470 – Research and Research Projects

- Expanding and refining comprehension of varied texts, technical materials, complex narratives, and reference sources
- Explaining how to identify, examine, synthesize, and evaluate to obtain information.
- Explaining how to read critically, ask pertinent questions, recognize assumptions and implications, and evaluate ideas.
- Gathering research data from a variety of sources to formulate, substantiate, or refute opinions or theories
- Uses research process: selecting topic, formulating questions, identifying key words, choosing sources, skimming, note-taking, organizing, and presenting
- Citing references using various formats (endnotes, bibliography)
- Recognizing styles of documentation (MLA, APA)
- Interpreting texts with supportive explanations to generate connections to real-life situations and other texts (business, technical, scientific)
- Recognizing the differences between plagiarizing, paraphrasing, and summarizing

Standard V – Life-Oriented Terms and Symbols

Lesson 500 – Words Common to Forms

- Listing guidelines for filling out a form/application
- Defining full name, legal name, surname, and maiden name
- Recognizing how to correctly write a name on a particular form
- Recognizing a correctly written address, telephone number, and zip code for a particular form
- Recognizing a Social Security number
- Recognizing personal information
- Recognizing the abbreviation for date of birth
- Recognizing a correctly written date of birth for a particular form
- Recognizing a correctly written place of birth for a particular form

- Defining military, veteran, legal guardian, parent, relative, disabilities, references, and relationship
- Matching items of personal information with the appropriate line of an application for a Social Security card

Lesson 505 – Employment Applications

- Defining employer and employee
- Defining terms common to job applications:
- work permit; Visa; Alien Registration card; race; religion; sex; national origin; age; marital status; veteran status ;non-job-related medical condition or handicap; Equal Opportunity Employer (EOE); position/job title; full-time; part-time; temporary; permanent; felony conviction; personal reference; work history, employment experience, or work experience; wage; salary; reason for leaving; work performed/duties and responsibilities; skills/qualifications; education

Lesson 510 – Educational Applications

- Defining terms common to the education section of a job application:
- Attended; enrolled; elementary or grade school; middle school; junior high school; high school; post-secondary schooling; name of school or school name; location of school; dates attended; courses; credit; grade level; degree or diploma; grade point average; transcript; extracurricular activities; class standing; training;
- Defining terms related to financing one's schooling:
    - tuition
    - student loan
    - financial aid
    - tuition waiver
    - grant
    - scholarship
- Defining terms related to coursework:
    - transfer
    - prerequisite

Lesson 515 – Financial Forms

- Defining terms related to banking:
- bank account; automated teller; automated loan; payment; deposit or credit; withdrawal or debit; savings account; interest; penalty; checking account; check; account number; withdrawal/deposit slip; check stub; check register; balance/balance; forward/new balance; deduction; bank charges; currency;net deposit; endorsing a check;buying on credit;annual percentage rate (APR);mortgage; loan balance; finance charges; asset; liability; net worth;
- Identifying information written in a particular sections of a check
- Identifying correctly written amounts on a check
- Matching items of personal information with the appropriate line on a deposit slip
- Matching items of personal information with the appropriate line on a credit card application

Lesson 520 – Tax Forms

- Defining terms related to the Employee's Withholding Allowance Certificate (W-4 form):
  Dependent; spouse; marital status; head of household; Social Security number; allowance exemption/exempt; Personal Allowances; Worksheet; itemized deductions
- Explaining the Wage and Tax Statement (W-2 form)
- Distinguishing between the W-4 form and the W-2 form
- Identifying information on a completed W-2 form
- Defining terms related to filling out income tax forms (1040 forms):
  filing status; dividends; joint return; standard Deduction; marital status; deduction; head of household; refund; types of income; occupation

Lesson 525 – Leases, Licenses and Registration Forms

- Defining terms relating to leases:
- lease; landlord; tenant; lessee; lessor; residential lease;business or commercial lease; premises term/full term; agent; security deposit; late charge; returned check charge
- Labeling and; identifying information on a completed lease
- Defining Change of Address form terms;Recognizing where information should be;written on a Change of Address form
- Defining terms in applying for a driver's license
- Identifying information written on an application for a learner's permit
- Recognizing where information should be written on an application for a learner's permit
- Identifying terms related to voter registration
- Recognizing where information should be written on a voter registration application

Lesson 530 – Transportation Schedules

- Defining terms related to bus/train schedules
- Reading train timetable: arrival/departure times, train numbers, days of operation, symbols/key, etc.
- Reading a bus schedule: arrival/departure times, express buses, transfer symbols, etc.
- Reading video display screens in airports: arrival/departure times, flight numbers, and gate locations

Lesson 535 – Product Labels

- Reading food labels: ingredients, additives, RDA, per serving information, etc.
- Defining RDA (Recommended Daily Allowance)
- Reading medicine labels: refills, dosage, etc.
- Reading labels of products containing poisonous chemicals: proper use, warning, etc.

Lesson 540 – Words and Symbols on Signs

- Identifying the shape, color, and meaning of road signs and construction signs
- Identifying the shape, color, and meaning of signs giving information
- Identifying signs related to highway travel
- Identifying signs in and around buildings
- Identifying signs for pedestrians
- Identifying signs giving safety information on the job and at home

Standard VI – Literary Skills

Lesson 600 – Types of Literature

- Distinguishing between prose and poetry
- Distinguishing drama from prose and poetry
- Distinguishing between fiction and nonfiction
- Distinguishing between biography/autobiography
- Identifying a passage as science fiction
- Identifying a passage as a fable
- Identifying the type of literature of a passage
- Identifying the setting of a passage
- Identifying point of view
- Analyzing how point of view affects a work
- Determining the speaker of a literary work
- Distinguishing statements of plot and theme

Lesson 605 – Techniques of Poetry

- Defining rhyme and rhythm
- Defining free verse and blank verse
- Defining ballad
- Defining types of poetry (narrative, dramatic, lyric)
- Identifying alliteration in a poem
- Defining stylistic devices, such as assonance, consonance, word order, word choice, etc.
- Identifying onomatopoeia
- Identifying imagery in a passage from a poem
- Identifying a simile and metaphor
- Identifying personification
- Identifying hyperbole
- Identifying allusion
- Defining symbol
- Identifying symbols and their meaning
- Defining/identifying figurative language, such as symbolism, oxymorons, etc.
- Identifying the tone of a passage from a poem

Lesson 610 – Techniques of Prose and Drama

- Identifying elements of fiction (plot, setting, theme)
- Analyzing the effectiveness of complex elements of plot, such as setting, major events, problems, conflicts, and resolutions
- Identifying climax, technical climax, and dramatic climax in a given piece of writing
- Defining/identifying types of conflicts, internal conflict (man v. self), and external conflict (man v. man, man v. nature, man v. society, and man v. fate)
- Comparing/contrasting conflict in multiple texts
- Evaluating an author's use of mood
- Defining/determining tone from analysis of word choice (diction), setting, characterization
- Defining flashback
- Defining foreshadowing
- Defining dialogue
- Evaluating an author's use of aside
- Evaluating an author's use of soliloquy
- Evaluating an author's use of irony

Lesson 615 – Elements of Literary Character

- Identifying the way character is revealed
- Identifying character traits based on a passage
- Identifying a character's state of mind based upon reading a passage

- Identifying a character's motive
- Identifying the main character in a passage
- Defining the terminology/ identify characters as major or minor, as flat or round, as static or dynamic, as protagonist or antagonist
- Defining/identifying characterization as direct or indirect
- Defining/characterizing/recognizing the use of stereotypes

Lesson 620 – Author's Style

- Recognizing and identifying differing style techniques
- Analyzing various genres as records of life experiences
- Analyzing the effects of an author's life, culture, and philosophical assumptions and an author's purpose and point of view
- Explaining how imagery reveals an author's purpose
- Comparing and contrasting an author's word choice and syntax within text
- Comparing and contrasting author's word choices and syntax in two or more texts
- Paraphrasing and synthesizing ideas of several authors on one topic. In response to test questions, the student may be asked to summarize, paraphrase, analyze, and evaluate texts, and compare/contrast findings from two or more texts
- Selecting/using effective characteristics of quality literature to refine personal communication style
- Distinguishing between formal and informal styles of language and identifying dialect
- Analyzing effectiveness, contribution (cultural, regional, historical), and appropriateness of dialect and diction in print and non-print sources

Lesson 625 – American Literature

- Applying knowledge of literary terms
- Reading, discussing, and analyzing American literature representing diversity (gender, ethnicity)
- Understanding of the effect of history on American literature (e.g., literary movements, periods)
- Identifying, comparing, and responding to United States literature that represents the experiences and traditions of diverse ethnic groups
- Identifying cultural vocabulary
- Identifying the social situation of a character by analysis of the character's use of language
- Reading works of literature and responding to guided questions, especially American Literature
- Analyzing distinctive elements (recurrent themes, historical significance, literary techniques) of American Literature
- Evaluating literary works (American) for historical significance; understanding interaction between culture and literary works
- Analyzing how works of a given period reflect historical events (American)
- Understanding major cultural, religious, philosophical, and political influences on the literature of the United States
- Making connections with real-world situations and the human experience through American literature

Lesson 630 – British Literature

- Applying knowledge of literary terms to works of literature
- Reading works of literature and responding to guided questions, especially British Literature, Shakespeare
- Evaluating literary works (British) for historical significance; understanding interaction between culture and literary works
- Analyzing distinctive elements (recurrent themes, historical significance, literary techniques) of British literature
- Analyzing how works of a given period reflect historical events (British)
- Understanding major cultural, religious, philosophical, and political influences on the literature of the British Isles
- Making connections with real-world situations and the human experience through British literature

Lesson 635 – World Literature

- Applying literary terms to works of literature
- Analyzing the relationship between contemporary writing and past literary traditions
- Understanding major cultural, religious, philosophical, and political influences on the literature of a given period or culture
- Gaining insight into human behavior from the study of literature
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(→) Lesson 635 – World Literature

- Identifying, comparing, and responding to world literature that represents the experiences and traditions of diverse ethnic groups
- Demonstrating an understanding of the effects of literary elements and techniques in culturally diverse written texts
- Demonstrating a basic understanding of culturally diverse written texts
- Comparing and contrasting universal literary themes within and between texts
- Understanding that language usage is shaped by social, cultural, and geographical differences
- Analyzing distinctive elements (recurrent themes, historical significance, literary techniques) of ancient and world literature
- Analyzing a diversity of ideas generated by authors of different races, beliefs, genders, ages, etc.
- Making connections with real-world situations and the human experience through world literature
- Evaluating literary works for historical significance (world); understanding interaction between culture and literary works
- Analyzing how works of a given period reflect historical events (world)
- Demonstrating the ability to analyze and critically evaluate culturally diverse written texts and visual representations

Reading Passages

Level 500 Passages (F-K 5.2-5.9)

- Annie Oakley
- Increasing Your Vocabulary
- What to Do After an Automobile Accident
- Ellis Island
- Early American Pilgrims

Level 600 Passages (F-K 5.9-6.8)

- Joan of Arc
- Interesting Bits About Karate
- Winterizing a Home
- Tom Brown, Tracker
- Fourth of July Barbecue

Level 700 Passages (F-K 7.0-7.8)

- Common Colds
- Mount Krakatau
- California Conservation Corps
- Bronx High School of Science
- The Last Passenger Pigeon Hunt

Level 800 Passages (F-K 8.0-8.8)

- The Camping Trip
- Vesuvius, Herculaneum, and Pompeii
- The Whooping Crane
- Political Candidates, Then and Now
- The Sinking of the Titanic

Level 900 Passages (F-K 9.0-9.8)

- The Invention of the Automobile
- Janice Carter's Chimpanzees
- Journal Entry: Flooded Camp Travelling West
- The International Geophysical Year
- Yellowstone in Winter

Level 1000 Passages (F-K 10.1-10.7)

- Retiring to the Monastery
- The Place Where the Dog Ran
- Historical Attempts at Controlling Weather
- Traffic is a Complicated Problem
- Talking Trees

Level 1100 Passages (F-K 10.9-11.8)

- All About Orchids
- The Tragedy of the USS Squalus
- ArtCenter College of Transportation Design
- Chocolate from the Aztecs
- Reclaiming the Zuiderzee

Level 1200 Passages (F-K 12.1-12.5)

- Physiognomy and Phrenology
- The Phenomenon of Maternal Bonding
- The Peace Corps
- Nature Versus Nurture
- Mary McLeod Bethune

Language

Standard I – Grammatically Correct Sentences

Lesson 100 – Nouns

- Forming plural of nouns following the general rule
- Forming the plural of nouns ending in f or fe
- Forming the plural of nouns ending in y
- Forming plural of nouns ending in s, x, z, ch, or sh
- Identifying nouns with the same singular and plural
- Forming the plural of nouns with irregular plurals
- Forming the singular possessive
- Defining proper noun and common noun
- Forming the plural possessive
- Forming separate and joint possessives

Lesson 110 – Pronouns

- Defining pronoun
- Explaining gender as related to pronouns
- Explaining number as related to pronouns
- Explaining pronoun-antecedent reference
- Explaining subject/predicate nominative pronouns
- Explaining object pronouns
- Explaining the correct use of who and whom
- Explaining possessive pronouns
- Explaining reflexive pronouns
- Explaining correct use of sound-alike pronouns (who's/whose, your/you're, their/they're/there)

Lesson 120 – Verbs

- Defining verb
- Explaining action verbs
- Explaining state-of-being/linking verbs
- Distinguishing between singular and plural verbs in present tense
- Identifying the principal parts of verbs
- Identifying future tense
- Using the past participle of regular verbs with has, have, and had
- Using the present participle with to be verbs
- Stating and using principal parts of irregular verbs

Lesson 130 – Subject-Verb Agreement

- Defining subject and verb
- Identifying the subject and verb in declarative, imperative, and interrogative sentences
- Identifying the subject in sentences beginning with there and here
- Defining subject-verb agreement
- Using doesn't and don't correctly
- Determining agreement between subject and to be verb in past tense
- Determining agreement between compound subject and present tense verb
- Determining agreement between indefinite pronoun subject and present tense verb
- Determining agreement between compound subject joined by either/or-neither/nor & present tense verb

Lesson 140 – Adjectives and Adverbs

- Defining adjective
- Defining articles
- Explaining possessive and demonstrative pronouns as adjectives
- Defining common adjective and proper adjective
- Defining adverb
- Explaining comparison of adjectives
- Explaining comparison of adverbs
- Using degrees of comparison correctly
- Using good, well, and badly correctly

Lesson 150 – Parts of Speech

- Identifying the preposition
- Identifying the object of the preposition
- Identifying a prepositional phrase
- Identifying a conjunction
- Identifying a coordinating conjunction in a compound sentence
- Identifying a subordinating conjunction in a complex sentence
- Identifying an interjection

Standard II – Structurally Correct Sentences

Lesson 200 – Sentences: Parts and Types

- Defining subject
- Defining predicate
- Identifying the complete and simple subject
- Identifying a compound subject
- Identifying a compound predicate
- Identifying a compound sentence
- Identifying coordinate conjunctions

- Defining complex sentence
- Defining dependent clause
- Identifying dependent clauses
- Identifying subordinate conjunctions

Lesson 210 – Sentences: Fragments and Run-ons

- Defining sentence fragment
- Identifying sentence fragments
- Identifying complete sentences
- Identifying dependent clauses as fragments
- Identifying prepositional phrases as fragments
- Identifying –ing phrases as sentence fragments
- Identifying an appositive phrase (renaming phrase) as part of a sentence fragment
- Correcting sentence fragment by adding a word or words to make a complete sentence
- Defining run-on sentence
- Correcting run-on sentence with subordinate clause
- Correcting run-on sentence using a comma and coordinating conjunction
- Correcting run-on sentence with items in series
- Correcting a run-on sentence by dividing it

Lesson 220 – Sentences: Combining

- Combining sentences with compound predicates
- Combining sentences with compound subjects
- Combining sentences with adjectives
- Combining sentences with appositive phrases
- Combining sentences: who, which, or that
- Combining sentences with subordinating conjunctions
- Combining sentences with the word but

Lesson 230 – Sentence Revising

- Defining unity, coherence, and emphasis
- Positioning the main idea of a sentence in the independent clause
- Combining related short sentences into one complex sentence
- Using gerund phrases correctly
- Using participial phrases correctly
- Rewriting sentences starting with it, they, you, there
- Placing adverbs correctly
- Using farther and further correctly
- Using teach and learn correctly
- Using affect and effect correctly
- Using principal and principle correctly
- Using fewer and less correctly
- Using amount and number correctly
- Using from and off correctly

Lesson 240 – Nonstandard Usage

- Identifying ways words change over time
- Explaining and identifying slang
- Identifying and correcting double negatives
- Identifying and correcting of/have
- Correcting the omission of the present tense of to be in a sentence
- Correcting use of be as only verb in predicate
- Identifying and correcting hisself/theirselves
- Identifying and correcting unnecessary prepositions

Standard III – Information in Logical Order

Lesson 300 – Arranging Sentences

- Arranging directions in logical order
- Arranging directions logically using clue words indicating order
- Arranging sentences that describe events using clue words indicating time
- Arranging sentences from general to specific
- Arranging sentences about ideas from general to specific using organizing clue words

Lesson 310 – Arranging Paragraphs

- Defining general statement
- Defining specific example
- Identifying general statements & specific examples
- Identifying the parts of a paragraph
- Defining concluding sentence
- Identifying topic, supporting, concluding sentences
- Identifying unrelated sentences in a paragraph
- Identifying a shift in point of view
- Identifying paragraphs in logical time order
- Identifying a unified paragraph
- Identifying the appropriate place to begin a new paragraph

Lesson 320 – Transition Words and Phrases

- Using transition words that show cause (therefore, because, since, consequently)
- Using the transition word then to show time relationship
- Using transition words that show comparison (likewise, furthermore, in addition)
- Using transition words that show contrast (however, although, on the other hand)
- Using transition phrases to introduce an example (for instance, for example)

Lesson 330 – Messages

- Essential information for a telephone message
- Essential information in an invitation
- Essential information for an announcement
- Essential information in a request for supplies
- Identifying essential information to include in a request for action
- Identifying essential information for a school assignment

Standard IV – Proper Format of Letters

Lesson 400 – Letters

- Defining business letter and friendly letter
- Explaining the differences between business and friendly letters
- Heading of a business letter
- Inside address of a business letter
- Salutation of a business letter
- Explaining the body of a business letter
- Identifying the correctly written closing of a business letter
- Identifying the parts of a friendly letter
- Explaining how to address an envelope for a friendly letter and a business letter

Standard V – Accurate and Complete Forms

Lesson 500 – Application Forms: Unit 1

- Listing general guidelines for filling out forms
- The correct way to fill in one's name, address, and telephone number on a form
- Writing one's social security number on a form
- Writing one's birth date, place of birth on a form
- Filling out personal data on a form
- Writing one's references on a form
- Explaining terms specific to a job application
- The correct way to fill out the work history section of a job application
- The correct way to fill out the education section of a job application
- The correct way to sign an application form

Lesson 510 – Application Forms: Unit 2

- Identifying the correct information for filling out a change of address form
- Identifying the correct information for filling out an application for a Social Security card
- Identifying the correct information for filling out an application for a driver's license
- Identifying the correct information for filling out an application for a voter registration card
- Identifying the correct information for filling out an application for a marriage license

Lesson 520 – Financial Forms

- Defining lease
- Explaining terms specific to a lease
- Reading a completed lease
- Identifying the parts of a blank check
- How to write a check or check stub
- How to fill out a check register
- How to fill out a deposit slip
- How to fill out a credit application
- How to fill out a business license application

Standard VI – Punctuation Marks

Lesson 600 – End Marks

- Defining complete sentence
- Defining declarative sentence
- Using a period to punctuate a declarative sentence
- Defining imperative sentence
- Using a period or exclamation point to punctuate an imperative sentence
- Defining exclamatory sentence
- Using an exclamation point to punctuate an exclamatory sentence
- Defining interrogative sentence
- Using a question mark to punctuate an interrogative

Lesson 610 – Commas: Unit 1

- Using a comma to punctuate words in a series
- Identifying when to use a comma between consecutive adjectives before a noun
- Using a comma in a series
- Using a comma to punctuate a series of independent clauses

Lesson 620 – Commas: Unit 2

- Using a comma to punctuate a direct address
- Using a comma correctly in a street address
- Using a comma correctly in a date

Lesson 630 – Commas: Unit 3

- Using a comma after introductory word/phrase
- Using a comma after introductory clause
- Using a comma after participial phrase
- Using commas to set off non-introductory dependent clause
- Using commas to set off interrupting phrase
- Using commas to set off appositive

Lesson 640 – Apostrophes

- Defining possessive
- Forming singular possessive of nouns
- Forming plural possessive of nouns
- Forming irregular plural possessives
- Forming joint and separate noun possessives
- Explaining possessive pronouns
- Defining contraction
- Forming contractions of pronouns with verbs
- Forming contractions of verbs with not

Lesson 650 – Quotation Marks

- Distinguishing between direct/indirect quotes
- Punctuating direct quotes where identifier occurs before, after, or interrupts the quote
- Identifying identifiers
- Punctuating direct quote that is a question
- Punctuating an interrogative sentence containing a direct quote
- Punctuating direct quote that is an exclamation
- Punctuating direct quotes

Lesson 660 – Colons and Semicolons

- Using a colon after a dependent clause to introduce a series
- Using a colon after the following or these to introduce a series
- Using a colon after as follows
- Using a colon between two independent clauses not connected by a conjunction when the second clause explains the first
- Using a colon to separate hours and minutes expressed as figures
- Using a colon in a business letter salutation
- Using a semicolon between independent clauses not connected by a conjunction
- Using a semicolon between independent clauses linked by a transitional expression
- Using a semicolon in a series or to separate a series of dependent clauses

Lesson 670 – Abbreviations and Titles

- Italicizing (or underlining) titles of a complete literary work or artistic work
- Capitalizing title of literary or artistic works
- Using quotation marks around part of a complete published work or short work
- Punctuating abbreviated personal titles

Standard VII – Capitalization

Lesson 700 – Capitalization

- The first word of a sentence
- The first word of a direct quote
- The pronoun, I
- Proper nouns; proper adjectives
- The days of the week and months of the year
- The names of holidays and special events
- Personal, professional, and family titles
- The names of religious, racial, and political groups and names of organizations
- The names of directions as places
- The initials in a name
- Title of a literary or artistic work
- Names of historic periods, events, documents, and memorials

Standard VIII – Errors in Written Material

Lesson 800 – Proofreading

- Correcting errors in capitalization
- Correcting errors in punctuation
- Correcting run-on sentences and fragments
- Correcting errors in pronoun-antecedent agreement
- Using the correct form of -self pronouns
- Correcting errors in subject-verb agreement
- Correcting errors in verb tense consistency
- Correcting errors in parallel structure
- Correcting errors in spelling
- Finding and replacing missing words

Standard IX – Dictionary Skills

Lesson 900 – Dictionaries

- Alphabetizing and defining guide words
- Using guide words to locate a word
- Reading the phonetic respelling of a word
- Locating the correct spelling of a word
- Determining part of speech from an entry
- Identifying the plural of a noun from an entry
- Identifying principal parts of a verb from an entry
- Determining which definitions of a word to use

Writing

Standard I – Grammatically Correct Writing

Lesson 100 – Orientation to Writing

- Understanding the importance of strong writing skills in personal, civic, and professional life
- Differentiating the four primary modes of writing: description, narration, explanation, and persuasion
- Understanding the characteristics of effective writing: grammatical correctness, clarity, style
- Understanding writing as a multi-stage process: pre-writing, drafting, and revising
- Understanding the structure and standards of the Writing system

Lesson 110 – Complete Sentences

- Writing complete sentences
- Recognizing sentence fragments
- Writing questions
- Writing commands
- Writing exclamations
- Differentiating sentence fragments/sentences
- Recognizing run-on sentences
- Recognizing comma splices
- Correcting run-on sentences

Lesson 120 – Subject-Verb Agreement

- Identifying the subject and verb in a sentence
- Making the verb agree with singular subject
- Making the verb agree with plural subject
- Making the verb agree with personal pronoun
- Subject-verb agreement with a prepositional phrase
- Making the verb agree with indefinite pronoun
- Making the verb agree with compound subject

Lesson 130 – Parallelism

- Defining parallelism
- Making verbs in a series parallel
- Making verbal phrases in a series parallel
- Correcting faulty parallelism in a sentence

Lesson 140 – Pronoun Reference and Agreement

- Defining antecedent
- Identifying singular and plural personal pronouns
- Stating the rule for pronoun/antecedent agreement
- Personal pronoun and antecedent agreement
- Identifying singular and plural indefinite pronouns
- Making an indefinite pronoun and antecedent agree
- Correcting unclear pronoun reference
- Correcting inconsistent point of view in writing

Lesson 150 – Correctly Placed Modifiers

- Identifying and correcting dangling modifiers
- Identifying and correcting misplaced modifiers

Lesson 160 – Verb Tense Consistency

- Identifying verbs in present, past, and future tense
- Distinguishing between regular/irregular verbs
- Explaining consistency in verb tense
- Correcting inconsistency in verb tense

Lesson 170 – Parenthetical Punctuation

- Defining parenthetical phrase
- Defining a renaming phrase (appositive phrase)
- Using parenthetical and non-essential phrases
- Using the colon correctly
- Using the dash correctly
- Using parentheses correctly
- Using brackets correctly

Lesson 180 – Split Infinitives

- Defining infinitive
- Identifying infinitives and infinitive phrases
- Punctuating introductory infinitive phrases
- Defining split infinitive
- Correcting split infinitives

Standard II – Clear and Concise Writing

Lesson 200 – Common Problem Words

- Correcting usage problems arising from confusing/misusing the following words:
- its and it's, accept and except, all ready and already, desert and dessert, principle and principal, loose and lose, who's and whose, among and between, their, there, and they're, can and may, passed and past, fewer and less, your and you're, lie and lay

Lesson 210 – Wordiness and Redundancy

- Explaining redundancy and wordiness
- Enumerating common types of wordy phrases
- Rewriting wordy sentences

- Revising by limiting qualifiers
- Correcting sentences containing the phrase “the fact that”

Lesson 220 – Double Negatives

- Writing sentences expressing the negative Identifying common negative words
- Defining double negative
- Correcting double negatives in sentences
- Correcting improper adjective comparison
- Identifying clear and unclear similes

Lesson 230 – Concrete and Specific Language

- Defining general and specific language
- Identifying general and specific words
- Identifying general and specific sentences
- Using adjectives to add specificity
- Replacing complex words with simpler words
- Defining abstract and concrete language
- Identifying abstract and concrete words
- Identifying vague or general verbs and replacing them with precise, descriptive verbs

Lesson 240 – Facts, Details, and Examples

- Defining and explaining assertion sentence
- Distinguishing assertion sentences from supporting sentences
- Identifying a well-developed paragraph
- Identifying the topic sentence in a paragraph
- Identifying a supporting sentence in a paragraph
- Identifying topic and supporting sentences in a descriptive, narrative, explanatory, and persuasive paragraph

Lesson 250 – Clear Subjects

- Revising sentences with the subject ‘you’
- Revising sentences beginning with ‘there’
- Revising sentences with ‘it’
- Revising sentences with this, these, or those
- Writing sentences with important detail as subject

Standard III – Sentence Combining

Lesson 300 – Combining Using Clauses and Conjunctions

- Combining sentences using the appropriate coordinating conjunction
- Combining sentences using a relative pronoun
- Essential and nonessential phrases, and clauses
- Punctuating nonessential clauses correctly
- Combining sentences using a subordinating conjunction

Lesson 310 – Combining Subjects and Predicates

- Combining sentences by combining subjects
- Combining indirect objects
- Combining direct objects
- Combining verb phrases
- Combining sentences by combining what, how, where, when, or why details

Lesson 320 – Combining with Conjunctive Adverbs

- Defining conjunctive adverb
- Identifying conjunctive adverbs
- Punctuating sentences with conjunctive adverbs
- Choosing the appropriate conjunctive adverb for combining
- Placing a conjunctive adverb in various positions in a sentence

Lesson 330 – Other Combining Techniques

- Combining using a past participle phrase
- Combining using a present participle phrase
- Combining sentences using an appositive
- Combining sentences using an infinitive phrase
- Combining sentences using a nominative absolute

Standard IV – Competent Writing

Lesson 400 – Varying Sentence Beginning

- Beginning with an adjective phrase
- Beginning with a prepositional phrase
- Beginning with an infinitive phrase
- Beginning with an adverb
- Beginning with nouns in a series
- Beginning with present participle phrases
- Beginning with past participle phrases

Lesson 410 – Clichés

- Identifying common clichés
- Revising clichés using specific language

Lesson 420 – Diction

- Identifying three levels of diction
- Identifying the level of diction appropriate for a particular audience

- Identifying slang
- Identifying consistent diction within a sentence
- Recognizing words expressing a positive connotation
- Recognizing words expressing a negative connotation
- Choosing words that match the writer's tone

Lesson 430 – Active and Passive Voice

- Explaining active voice
- Identifying sentences written in active voice
- Explaining passive voice
- Identifying sentences written in passive voice
- Stating rationale for using active voice
- Stating rationale for using passive voice
- Revising sentences written in passive voice

Standard V – The Writing Process

Lesson 500 – Introducing the Writing Process

- Explaining prewriting
- Defining composing
- Defining revising
- Defining modes of discourse

Lesson 510 – Prewriting

- Generating ideas through brainstorming
- Organizing brainstorming ideas
- Generating an appropriate main idea for a group of supporting details
- Generating appropriate supporting details for a stated main idea
- Main ideas and supporting details in an outline

Lesson 520 – Composing Paragraphs

- Developing complete sentences from a list of supporting details
- Using transition words in a paragraph
- Writing a topic sentence
- Explaining the introductory paragraph
- Explaining the concluding paragraph

Lesson 530 – Composing Essays

- Defining introduction, supporting paragraphs, and conclusion of an essay
- Explaining the use of transition words to connect paragraphs in an essay
- Distinguishing between descriptive, explanatory, narrative, and persuasive topics

Lesson 540 – Revising

- Explaining the revising process and proofreading
- Explaining revising for content, structure, purpose
- Explaining revising paragraphs, sentences, and transitions

Standard VI – Writing Applications

Cluster 1

- Description: Describing Yourself
- Narration: Writing a Personal Letter
- Narration: Creative Writing
- Explanation: Writing for High School Equivalency
- Description: Explaining a Process
- Persuasion: Writing an Argument
- Persuasion: Writing for High School Equivalency
- Description: Describing a Location

Cluster 2

- Writing a Character Sketch
- Comparing and Contrasting
- Supporting an Opinion
- Describing an Incident
- Creative Writing
- Narration: Writing a Personal Letter
- Writing a Letter of Complaint
- Writing for High School Equivalency

Cluster 3

- Comparing and Contrasting
- Explaining a Process
- Writing a Plot Summary
- Creative Writing
- Writing a Memo
- Writing an Inquiry Letter
- Writing for High School Equivalency

Spelling Scope and Sequence

Standard I – Basic Spelling

Lesson 100 – Beginner Vowel Sounds

- Spelling rules concerning vowels
- Understanding long vowels sound the same as the name of the letter (a, mate)
- Understanding a vowel sound is long if it is followed by a consonant plus a silent e (robe, mane, kite)
- Understanding two vowels together can also make a long vowel sound

  long a sounds nail, main, fail, pail
  long e sounds wheat, eagle, dream, tea
  long o sounds soap, road
- Understanding two vowels together do not have to be long (count, surround, avoid)
- Understanding that the consonant r controls the sound of a vowel that comes before it (nurse)
- Understanding that the letter y can sound like a consonant or a vowel
- Knowing when an a, e, i, o, or u is not present, the y sounds like i (my, spy)
- Knowing y sounds like e when a vowel is present (duty, empty)
- Knowing letters oy together sound like oi (oil, toy)

Lesson 110 – Beginner Consonant Sounds

- Understanding that two consonants can sound like a different letter
- Understanding long vowels sound the same as the name of the letter (a, mate)
- Understanding ph sounds like f (phone, phrase, nephew)
- Understanding a single consonant can sound like a different letter
- Understanding that g can sound like j (voyage, mileage)
- Understanding dg can sound like j (bridge, judge)
- Understanding that c can sound like s (bracelet, peace, force)
- Understanding that a consonant can be silent
- Understanding b is sometimes silent (numb, doubt)
- Understanding n is sometimes silent (column, autumn)
- Understanding t is sometimes silent (soften, listen)
- Understanding w is sometimes silent (wrench, answer)
- Understanding k is sometimes silent (knife, knot)
- Understanding f is sometimes silent (offer, afford)

Lesson 120 – Beginner Compounds and Homophones

- Knowing words made of two smaller words are called compounds
- Knowing to spell the smaller words first and then put the words together
- Knowing card+board = cardboard
- Knowing down+town = downtown
- Understanding long vowels sound the same as the name of the letter (a, mate)
- Knowing hand+made = handmade
- Knowing rail +road = railroad
- Understanding long vowels sound the same as the name of the letter (a, mate)
- Understanding common word endings
- Understanding these common suffixes: -ance (appear + ance = appearance, perform + ance = performance); -ion (destruct + ion = destruction, direct + ion = direction); -ment (appoint + ment = appointment, state + ment = statement)
- Understanding that when –ed is added to most words that end in a single consonant, you double the consonant before the –ed

  drop + ed = dropped
  snap + ed = snapped
  slam + ed = slammed
  cram + ed = crammed
- Understanding this common prefix: un-

  Un + clear = unclear
  Un + certain = uncertain
- Understanding that there are words that sound alike but are not spelled alike (These words are called homophones.)
- Knowing a list of some common homophones

  mane / main
  haul / hall
  stair / stare
  some / sum
  pear / pair
  pail / pale

Lesson 130 – Intermediate Vowel Sounds, Part 1

- Understanding that to learn how to spell words accurately you must pay particular attention to the sound of the vowels
- Knowing vowels can have many sounds; usually a vowel's sound depends on the consonants around it
- Knowing the letter y is special because it can sound like a vowel or a consonant
- Understanding it is a consonant in the word yellow, and a vowel in the word heavy
- Knowing when y starts a word, it is usually a consonant; when it sounds like the name of the letter e or i, then it is a vowel
- Understanding long vowels are vowels which sound the same as the name of the letter (a, mate)
- Knowing a vowel is almost always long if it is followed by a consonant plus a silent e (pale, Pete, pile, pole) unless that consonant is an r (care) (R-controlled vowels are always short)
- Knowing two vowels together can also make a long vowel sound

  Examples include oa, oi, ea, ei, and ie
- Knowing these long vowel sounds:

  Knowing vowel sounds: long a (fate, bait, tray, freight, grey); long e (Pete, feed, scream, field, bury); long i (dice, fry); long o (pole, boat, soul, show)
- Understanding that short vowels do not sound the same as the name of the letter (a, mat)
- Understanding that the vowel is always short in words that end in consonant (bet, bed, slid, pot, pull)
- Understanding that two vowels together can form a short vowel sound (noun, appoint, tread)
- Knowing vowels followed by r are usually short
- Knowing how to spell the days of the week and the months of the year

Lesson 140 – Intermediate Vowel Sounds, Part 2

- Understanding that long vowels are vowels which sound the same as the name of the letter (a, mate)
- Understanding that a vowel sound is almost always long if it is followed by a consonant plus a silent e (pale, pile, pole)
- Understanding that two vowels together can also make a long sound (feed, treat, boat, pail)
- Understanding that some long i and long e sounds are spelled with a y (cycle, busy)
- Understanding that short vowels are vowels which do not sound the same as the name of the letter
- Knowing that the consonant r often controls the sound of a vowel, softening what would otherwise be a long vowel (Compare the sounds of the a in state and stare.)
- Knowing that two vowels together can form a single sound (shout, discount, join, broil)
- Knowing that the schwa sound can be spelled with an a, e, i, or o
- Knowing that the long e sound requires i before e except after c (field, receive)
- Knowing that the long e sound requires these exceptions: leisure and seize
- Knowing the long a sound requires that some ei words are not long e sounds (neighbor, sleigh)

Lesson 150 – Intermediate Consonant Sounds

- Knowing the soft g is softened/extended as in range
- Knowing that the hard g is pronounced with full emphasis as in rug
- Knowing that the soft c is usually followed by the vowels e or i (sauce, cider)
- Knowing that the hard c is usually followed by the vowels a or o (calendar, collision)
- Knowing that words which have the eks sound are spelled ex (extra)
- Knowing that words which have the egz sound are also spelled ex (exaggerate)
- Knowing to use exc only when you hear the sound of s (exciting) or a hard c sound (excuse)
- Knowing that the letters ph sound like an f (telephone)
- Knowing some common words with silent consonants: silent b (bomb, doubt, crumb); silent h (rhyme, mechanic, honor); silent k (knives, knuckle, know); silent s (aisle, isle, island); silent t (soften, wrestle, rustle); silent w (wring, sword, wreck)
- Understanding that in words of only one syllable, you: 1. Double the final consonant when it follows a vowel (drip / dripping); 2. Do not double the final consonant when the final consonant is preceded by another consonant (help / helping); 3. Drop the silent e before adding –ing or –ed (grade / grading)
- Understanding that in words which have more than one syllable, you: 1. Double the final consonant only if the second syllable is stressed (repel / repelling); 2. Drop the silent e before adding any ending

Lesson 160 – Prefixes and Suffixes

- Knowing that most prefixes and suffixes are spelled the same no matter what word they are added to
- Knowing that the following prefixes and suffixes are always spelled the same: Prefixes: re- (reapply), en- (enroll), con- (contemporary), pre- (precaution), de- (depress), dis- (disarm), non- (nonstop), in- (incapable), un- (unsuitable); Suffixes: -ment (refinement), -ed (ignored), -ing (speaking), -ness (emptiness)
- Knowing that some suffixes which mean the same thing are spelled differently according to the root word with which they are used: -ion (division), -ian (magician), -ance (abundance), -ence (insistence), -ly (secretly), -ally (basically), -ous (prosperous), -eous (courageous), -uous (strenuous), -ible (flexible), -able (portable)

Lesson 170 – Intermediate Compounds and Homophones

- Knowing that compound words can be learned by breaking them down into their parts
- Knowing that a compound word is a word made of two or more words (cupboard = cup + board)
- Knowing that one group of compounds is made up of pronouns that represent indefinite people or things: anybody, anything, everything, sometimes, someone, somebody, none
- Knowing that contractions are compound words that have letters or a letter left out
- Knowing that contractions use an apostrophe (') in place of the missing letters
- Knowing this list of sound-alike contractions: it's / its; who's / whose; they're / their / there
- Knowing this list of problem homophones: whether / weather; advice / advise; pane / pain; hole / whole; principal / principle; coarse / course; stationary / stationery; picture / pitcher; affect / effect; cereal / serial; capital / capitol; hall / haul; piece / peace; some / sum; two / to / too

Standard II – Advanced Spelling

Lesson 200 – Advanced Vowel Sounds

- Knowing long vowels are vowels which sound the same as the name of the letter (a, mate)
- Knowing a vowel sound is long if followed by a consonant plus silent e (fake, kite, cope, cube)
- Knowing two vowels together can also make a long sound (feasible, sheen, approach, waiver)
- Knowing that some long i and long e sounds are spelled with a y (urgency, rectify)
- Knowing that short vowels are vowels which do not sound the same as the name of the letter
- Knowing that the consonant r often controls the sound of a vowel, softening what would otherwise be a long vowel (stare, firm, curt)
- Knowing that two vowels together can form a single sound (lounge, discount, convoy, turmoil)
- Knowing that the schwa sound can be spelled with an a, e, i, or o
- Knowing the spelling rules for the ie / ei combinations
- Knowing that the long e sound requires i before e except after c (retrieve, deceit)
- Knowing that the long e sound requires these exceptions: leisure, seize
- Knowing that the long a sound requires some ei words as long a sounds (neighbor, freight)

Lesson 210 – Advanced Consonant Sounds

- Knowing that the soft c is usually followed by the vowels e or i (spruce)
- Knowing that the hard c is usually followed by the vowels a or o (calendar)
- Understanding which have the eks sound are spelled ex (extra)
- Understanding which words have the egz sound are also spelled ex (exaggeration)
- Knowing that you use exc only when you hear the sound of s (exciting)
- Knowing that the letters ph sound like an f (telephone)
- Knowing some common words with silent consonants: silent b (bomb, doubt, plumber); silent c (scissors, ascent, crescent); silent h (rhyme, rhubarb, ghastly); silent t (soften, wrestle, rustle); silent w (wring, wreckage, answer)
- Knowing that consonants are usually doubled to signal that the vowel preceding the doubled consonant is short

Lesson 220 – Advanced Prefixes and Suffixes

- Knowing that most prefixes and suffixes are spelled the same no matter which word they are added to
- Knowing the following prefixes and suffixes are always spelled the same: Prefixes: re- (reapply), en- (endangered), dis- (disenchanted), un-

(unpredictable), sub- (subconscious), super- (supersonic), trans- (transoceanic); Suffixes: -ment (apartment), -ness (emptiness), -ship (friendship), -ity (minority), -al (comical)

- Knowing that some suffixes which mean the same thing are spelled differently according to the root word with which they are used
- Knowing that the following suffixes may cause problems: -ion (exemption), -ian (electrician), -ance (vigilance), -ence (coherence), -ly (valiantly), -ally (physically), -ous (hazardous), -eous (courageous), -uous (strenuous), -ible (tangible), -able (despicable)

Lesson 230 – Problem Words

- Understanding that homophones are words that are spelled differently and have different meanings but sound alike, such as sight and site
- Understanding that homonyms are words that are spelled the same and sound the same but have different meanings, such as bill (a duck's beak) and bill (a check needing to be paid)
- Understanding that homographs are words that are spelled the same but sound differently and have different meanings, such as sewer (a person who sews) and sewer (wastewater pipe)
- Understanding that context is the sentence surrounding a word that helps give it meaning
- Understanding that most nouns in English are made plural by adding s or es as a suffix, such as race, races and box, boxes.
- Knowing that there are exceptions to this rule, several of which are listed below: child / children, ox / oxen, man / men, woman / women, foot / feet, goose / geese, shelf / shelves, leaf / leaves
- Knowing that words borrowed from foreign languages often have strange plural forms.
- Understanding that for Greek words ending in –us it is necessary to change the –us to -i, such as: cactus / cacti, radius / radii, octopus / octopi, nucleus / nuclei, hippopotamus / hippopotami
- Knowing that for Latin words ending in –sis it is necessary to change the –sis to –ses, such as: analysis / analyses, thesis / theses, diagnosis / diagnoses, hypothesis / hypotheses, crisis / crises
- Knowing that some words are often used in their plural form, and their singular form is sometimes unknown, such as: graffiti (graffito), paparazzi (paparazzo), media (medium), data (datum), bacteria (bacterium), strata (stratum)
- Knowing that a singular noun is made possessive by adding an apostrophe and an s, such as the lifeguard's boat or Sandra's parakeet
- Knowing that all that is needed for plural words that end in s is an apostrophe, such as the girls' basketball team or the dogs' barking

Basic Math

Standard I – Whole and Decimal Numbers

Lesson 100 – Introducing Whole Numbers

- Writing cardinal number names from one to twenty
- Writing in words two-, three-, four-, five-, six-, and seven-digit cardinal numbers
- Identifying the place value of digits in a two-, three-, four-, five-, six-, or seven-digit number
- Placing the comma correctly in cardinal numbers of five or more digits
- Writing the cardinal number that corresponds to the number written in words
- Writing ordinal numbers by adding the suffix -st, -nd, -rd, or -th
- Writing in words ordinal numbers

Lesson 110 – Introducing Decimals

- Writing an amount of money in numbers that corresponds to the amount written in words
- Identifying the place value of the digits to the left of the decimal point
- Identifying the place value of the digits to the right of the decimal point
- Writing in words decimal numbers to the thousandth place
- Writing the decimal number that corresponds to the number written in words
- Determining whether two decimal numbers are equal in value (right-of-zero place value)

Lesson 120 – Rounding Numbers

- Rounding a whole number to the nearest ten
- Rounding whole number to nearest hundred
- Rounding whole number to nearest thousand
- Rounding whole number to nearest ten thousand
- Rounding decimal number to nearest whole
- Rounding decimal number to nearest tenth
- Rounding decimal number to nearest hundredth
- Rounding amount of money to nearest dollar
- Rounding amount of money to nearest dime

Lesson 130 – Comparing Decimals

- Determining which of two decimals (with no whole numbers) written to the tenth place is the larger
- Determining which of two (with no whole numbers) written to the hundredth place is the larger
- Determining which of two (with no whole numbers) written to the thousandth place is the larger
- Determining which of two (with no whole numbers) written to the tenth, hundredth, or thousandth place is the smaller
- Determining which of two (with no whole numbers) having different decimal places is the larger or the smaller
- Determining which of two (including a whole number) is the larger
- Determining which of two having the same whole number is the larger
- Arranging a list of decimals from smallest to largest and from largest to smallest
- Identifying the number from a list of decimals that is smaller or larger than a given decimal

Lesson 140 – Adding Whole and Decimal Numbers

- Identifying addends and sum in addition problems
- Adding one-digit whole numbers, arranged vertically and horizontally, without carrying
- Adding one-digit and two-digit whole numbers, arranged vertically and horizontally, no carrying
- Adding two-digit whole numbers, arranged vertically and horizontally, no carrying
- Adding whole numbers of more than two digits, arranged vertically and horizontally, no carrying
- Adding one-digit and two-digit whole numbers, arranged vertically and horizontally, carrying
- Adding whole numbers of more than two digits, arranged vertically and horizontally, carrying
- Adding decimals (with no whole numbers), arranged vertically and horizontally, no carrying
- Adding decimals (including whole numbers), arranged vertically and horizontally, no carrying
- Adding decimals vertically/horizontally with carrying

Lesson 150 – Subtracting Whole and Decimal Numbers

- Identifying the minuend, subtrahend, and difference in a subtraction problem
- Subtracting one and two digits, arranged vertically and horizontally, without borrowing
- Checking the answer to a subtraction problem by adding the difference and the subtrahend
- Subtracting three or more digits, arranged vertically and horizontally, without borrowing

- Subtracting one and two digits, arranged vertically and horizontally, with borrowing
- Subtracting three or more digits, arranged vertically and horizontally, with borrowing
- Subtracting decimals, arranged vertically and horizontally, with and without borrowing

Lesson 160 – Multiplying Whole and Decimal Numbers

- Identifying the multiplicand, multiplier, and product in a multiplication problem
- Multiplying one-, two-, three-, four-, and five-digit whole number multiplicands by a one-digit multiplier, arranged vertically and horizontally, without carrying
- Multiplying one-, two-, three-, four-, and five-digit whole number multiplicands by a one-digit multiplier, arranged vertically and horizontally, with carrying
- Multiplying one-, two-, three-, four-, and five-digit whole number multiplicands by a two-digit multiplier, arranged vertically, with and without carrying
- Multiplying one-, two-, three-, four-, and five-digit whole number multiplicands by a three-digit multiplier, arranged vertically, with/without carrying
- Multiplying decimals, arranged vertically, with and without carrying

Lesson 170 – Dividing Whole Numbers

- Identifying the divisor, dividend, quotient, and remainder in a division problem
- Writing division problems with both signs
- Dividing two-digit dividend by one-digit divisor
- Checking the answer to a division problem by multiplying the quotient by the divisor and adding the remainder
- Dividing three-digit dividend by one-digit divisor
- Dividing three-, four-, and five-digit dividends by one-digit divisor
- Dividing two-digit dividend by two-digit divisor
- Dividing a dividend of more than two digits by a two- and three-digit divisor

Lesson 180 – Dividing Decimal Numbers

- Identifying the divisor, dividend, quotient, and remainder in a division problem and the two division signs
- Dividing a decimal by a whole number
- Dividing a decimal by a decimal

Lesson 190 – Applications: Whole and Decimal Numbers

- Identifying clue words for addition in word problems
- Solving addition word problems
- Identifying clue words for subtraction in word problems
- Solving subtraction word problems
- Identifying clue words for multiplication in word problems
- Solving multiplication word problems
- Identifying clue words for division in word problems
- Solving division word problems

Standard II – Fractions

Lesson 200 – Introducing Fractions

- Distinguishing fractions from whole numbers
- Identifying the numerator and the denominator
- Identifying fractions that equal one
- Identifying common factors of a given fraction
- Reducing a fraction to its lowest terms
- Distinguishing mixed numbers from whole numbers and fractions
- Identifying proper and improper fractions
- Changing improper fraction to mixed number
- Changing mixed number to improper fraction

Lesson 210 – Comparing Fractions

- Determining which of two fractions having a common denominator is the larger
- Determining which of two fractions having a common denominator is the smaller
- Determining which of two fractions having unlike denominators is the larger
- Determining which of two fractions having unlike denominators is the larger by converting them to fractions with a common denominator
- Determining which of three or more fractions having unlike denominators is greater than one given fraction and less than another given fraction, both having unlike denominators

Lesson 220 – Adding Fractions

- Adding two or more proper fractions having a common denominator, vertically and horizontally
- Adding two or more proper fractions having unlike denominators, vertically and horizontally

- Adding a combination of proper fractions, whole numbers, and mixed numbers, arranged vertically and horizontally
- Changing a sum having an improper fraction to a sum that does not have an improper fraction

Lesson 230 – Subtracting Fractions

- Subtracting proper fractions having a common denominator
- Subtracting proper fractions having unlike denominators
- Subtracting mixed numbers whose fractions have a common denominator
- Subtracting mixed numbers whose fractions have unlike denominators
- Subtracting proper fraction from whole number
- Subtracting mixed number from whole number
- Subtracting fraction or mixed number from mixed number by borrowing

Lesson 240 – Multiplying Fractions

- Multiplying two proper fractions
- Multiplying proper fraction and whole number
- Multiplying proper fraction and mixed number
- Multiplying two mixed numbers
- Using cancellation when multiplying fractions
- Multiplying more than two fractions at once

Lesson 250 – Dividing Fractions

- Identifying a number's reciprocal
- Enumerating the steps for dividing fractions
- Dividing proper fractions
- Dividing a whole number by a proper fraction
- Dividing a proper fraction by a whole number
- Dividing a mixed number by a proper fraction
- Dividing by a mixed number

Lesson 260 – Applications Using Fractions

- Identifying clue words for addition in word problems involving fractions
- Addition word problems involving fractions
- Identifying clue words for subtraction in word problems involving fractions
- Subtraction word problems involving fractions
- Identifying clue words for multiplication in word problems involving fractions
- Multiplication word problems involving fractions
- Identifying the correct operation for solving a given word problem involving fractions
- Solving word problems involving fractions

Standard III – Equivalency

Lesson 300 – Fraction and Decimal Equivalency

- Converting a decimal to an equivalent fraction
- Converting a decimal which includes a whole number to an equivalent fraction
- Converting mixed decimal to equivalent fraction
- Converting a fraction having a power-of-ten denominator to an equivalent decimal
- Converting a fraction not having a power-of-ten denominator to an equivalent decimal
- Writing a repeating decimal as a mixed decimal to the hundredth place
- Converting a mixed number to an equivalent decimal

Lesson 310 – Percent, Fraction, and Decimal Equivalency

- Defining percent
- Converting a percent to an equivalent fraction
- Converting a percent to an equivalent decimal
- Converting a percent to an equivalent decimal and fraction
- Converting a decimal to an equivalent percent
- Converting a fraction to an equivalent percent

Standard IV – Probability and Statistics

Lesson 400 – Base, Percent, and Percentage

- Defining base, percent, and percentage
- Calculating percentage by formula
- Calculating a percentage of one percent by shortcut method
- Calculating a percentage of two to nine percent by shortcut method
- Calculating a percentage of less than one percent
- Calculating percentage greater than one hundred
- Calculating percent by formula
- Calculating base by formula
- Word problems for percent, percentage, and base

Lesson 410 – Ratio and Proportion

- Defining ratio
- Writing ratio correctly based upon a given description
- Setting up and solving ratio word problems

Lesson 420 – Probability I

- Defining probability
- Explaining the language of probability
- Defining sample space
- Calculating simple probability

Lesson 430 – Probability II

- Probability involving two or more events
- Probability involving two or more events using tree diagrams
- Defining and problems and or problems
- Solving and problems
- Solving or problems

Lesson 440 – Statistics

- Defining range, mean, mode, and median
- Determining the range, mean, mode, and median from given information

Lesson 450 – Data Collection and Analysis

- Defining hypothesis
- Identifying a treatment group
- Defining population, sample, and random sample
- Explaining the effect of bias in an experiment
- Identifying details represented on a graph
- Calculating the correct unidentified number in a series of numbers

Standard V – Consumer Applications

Lesson 500 – Estimation and Reasonable Answers

- Explaining the concept of estimating
- Estimating by rounding
- Identifying the most reasonable answer
- Estimating by comparison

Lesson 510 – Interpreting Graphs

- Identifying the title and scale of a graph
- Identifying specific information in a pictograph
- Identifying specific information in a bar graph
- Identifying specific information on the vertical and horizontal axes in a line graph
- Estimating values on a line graph
- Identifying specific information in a circle graph
- Identifying information in a Venn diagram

Lesson 520 – Interpreting Tables and Charts

- Identifying specific information on two different mileage charts
- Calculating the correct sales tax for various amounts using a state sales tax chart
- Calculating the total packing and shipping charges for purchases using two different packing and shipping charts
- Identifying information on a nutritional table
- Identifying specific information on a transportation schedule
- Identifying specific information on various other tables, including a federal income tax table and a life insurance table
- Calculating charges for telephone calls using a telephone rates table

Lesson 530 – Determining Change

- Identifying the correct smaller denomination bills as change for a larger money bill
- Identifying the correct coin change for a dollar
- Counting an amount of coins by multiples
- Counting amounts of bills and coins by multiples
- Determining by subtraction the correct change given the amount of a purchase and the amount of money tendered
- Counting out change beginning with the largest money denomination

Lesson 540 – Comparative Shopping

- Identifying weight abbreviations on product labels
- Comparing weights to determine equivalence
- Calculating unit cost
- Comparing unit costs to determine best buy
- Comparing additional charges/determining best buy

Lesson 550 – Cash Purchases

- Defining subtotal
- Calculating subtotal
- Calculating total cost given number of items and cost of each
- Calculating the total cost after discount
- Calculating total sale price given sale markdown and sales tax rate
- Calculating price given total cost and sales tax rate
- Calculating original price given total cost, sale markdown, and sales tax rate

Lesson 560 – Credit Purchases

- Identifying the principal, interest rate, and time
- Calculating interest
- Calculating installment payment of purchase with simple interest
- Calculating total of payments
- Calculating down payment
- Calculating amount to be financed given base price, down payment, and amount of taxes/fees
- Calculating total cost given amount of payment, time, down payment, taxes, and fees
- Defining compound interest
- Defining APR
- Comparing cash to credit purchases
- Calculating average daily balance

Lesson 570 – Salaries, Wages, and Commission

- Distinguishing between salary and wage
- Defining gross pay, deduction, and net pay
- Enumerating common deductions
- Calculating overtime
- Calculating gross pay and net pay
- Calculating commission

Lesson 580 – Distance, Rate, and Time Problems

- Identifying formula for calculating rate of speed, distance, and time
- Identifying the unit of measure for distance, time, and rate of speed
- Calculating rate of speed
- Calculating distance
- Solving word problems involving rate of speed, distance, and time
- Calculating MPG

Lesson 590 – Checking Accounts

- Distinguishing between the effect of making a deposit and writing a check on a checking account balance
- Calculating ending balance given amounts for deposits and checks
- Identifying specific information on a completed check stub

Standard VI – Measurement

Lesson 600 – Customary Measurement

- Converting various linear measurements using the unit conversion factor
- Converting various weight measurements using the unit conversion factor
- Converting various volume/capacity measurements using the unit conversion factor
- Identifying equivalents of linear, weight, and volume/capacity measurements
- Solving problems involving customary measurements

Lesson 610 – Metric Measurement

- Recalling rule for converting larger metric units to smaller ones and smaller metric units to larger ones
- Converting various linear measurements following conversion rule
- Converting various weight/mass measurements following conversion rule
- Converting various volume/capacity measurements following conversion rule

Lesson 620 – Working with Measurements

- Adding measurements
- Simplifying answers
- Subtracting measurements
- Multiplying measurements, units by units, units by units by units, and units by a number
- Calculating cubic measure equivalency
- Dividing measurements
- Employing the unit conversion factor in problems involving different units of measure

Lesson 630 – Time Problems

- Converting units of time using the unit conversion factor: hours to days, days to hours, minutes to hours, hours to minutes, days to weeks, weeks to days, minutes to seconds, seconds to minutes, months to years, and years to months
- Calculating ending time given a start time and elapsed time
- Calculating elapsed time given a start time and an end time
- Calculating starting time given an end time and elapsed time

Lesson 640 – Measuring Distance

- Determining the appropriate customary unit of measure to use
- Determining appropriate metric unit of measure
- Identifying the degree of precision of a ruler
- Measuring segments with a customary ruler
- Measuring line segments with a metric ruler
- Solving word problems involving measurements

Lesson 650 – Reading Scales and Gauges

- Reading thermometers
- Reading a speedometer
- Reading weight scales
- Reading the measurement of a given angle on a protractor

Advanced Math

Standard I – Pre-Algebra

Lesson 100 – Positive and Negative Numbers

- Identifying rational numbers
- Finding positive/negative numbers (number line)
- Determining the opposite of a number
- Comparing positive and negative numbers
- Understanding absolute value as distance from zero on the number line
- Word problems identifying absolute value

Lesson 110 – Multiplying and Dividing Rational Numbers

- Multiplying integers
- Dividing integers
- Multiplying and dividing decimals
- Multiplying fractions
- Dividing fractions

Lesson 120 – Adding and Subtracting Rational Numbers

- Adding positive and negative numbers
- Subtracting positive and negative numbers
- Adding rational numbers with more than two addends
- Finding the additive inverse

Lesson 130 – Exponents

- Evaluating numbers written as exponents
- Simplifying and evaluating expressions with negative exponents
- Expressing a number with a positive exponent as a number with a negative exponent
- Multiplying powers with the same base
- Raising a power to a power
- Dividing powers with the same base
- Writing a standard number in scientific notation
- Writing a number in scientific notation as a standard number
- Identifying prime and composite numbers
- Factoring composite numbers into a product of primes (prime factorization)

Lesson 140 – Roots

- Identifying the parts of a radical expression
- Determining the sign of a root
- Determining the root of radical expressions
- Multiplying and simplifying radical expressions
- Simplifying radical expressions with exponents
- Dividing radical expressions
- Simplifying fractions with radical expressions
- Adding and subtracting radical expressions

Lesson 150 – Variables

- Identifying variables, coefficients, and like terms
- Adding and subtracting like terms
- Multiplying and dividing like terms
- Simplifying fractions with variables

Lesson 160 – Operations with Variables

- Adding and subtracting variable expressions
- Adding and subtracting fractions with variables
- Simplifying fractions containing variables
- Multiplying and dividing fractions with variables
- Simplifying radical expressions with variables
- Adding and subtracting radical expressions containing variables
- Multiplying and dividing radical expressions containing variables

Lesson 170 – Order of Operations

- Simplifying numerical expressions that do not have grouping symbols
- Simplifying numerical expressions that have grouping symbols

Standard II – Geometry

Lesson 200 – Geometric Forms and Concepts

- Identifying and labeling lines, line segments, and rays
- Identifying and labeling angles
- Identifying plane figures
- Identifying three-dimensional figures

Lesson 205 – Protractors

- Identifying the correct placement of the protractor to measure an angle
- Reading measurements of angles with a protractor
- Identifying/measuring acute, obtuse angles
- Identifying congruent angles

Lesson 210 – Geometric Characteristics

- Identifying objects from various points of view
- Identifying the reflection of various figures
- Identifying the rotation of various figures
- Determining line(s) of symmetry

Lesson 220 – Rectangular Perimeter and Area

- Finding the perimeter of a rectangle
- Solving word problems involving perimeter
- Finding the area of a rectangle
- Solving word problems involving area

Lesson 230 – Nonrectangular Perimeter and Area

- Finding the perimeter of a polygon
- Finding the area of a polygon
- Finding the circumference of a circle
- Finding the area of a circle
- Finding the area of a composite figure

Lesson 240 – Volume

- Defining surface area and nets
- Determining surface area of a 3D figure using nets
- Solving real-world surface area problems using nets
- Finding the volume of a rectangular solid
- Finding the volume of a cylinder
- Finding the volume of a composite figure
- Solving word problems involving volume

Lesson 250 – Geometric Estimation

- Estimating perimeter, area, or volume of irregular figures
- Estimating measurements by rounding
- Recognizing reasonable answers

Lesson 260 – Scale Drawings

- Converting scale measurements to true measurements
- Using scale drawings to compute perimeter, area, circumference, and volume
- Determining the appropriate scale measurement to represent a given figure

Lesson 270 – Angles and Special Triangles

- Identifying and finding the measure of complementary and supplementary angles
- Identifying and finding the measure of angles formed by two intersecting lines
- Measuring angles formed by the intersection of a transversal and two parallel lines
- Finding the measure of one angle in a triangle given the measure of the other two angles

Lesson 271 – Right Triangles

- Finding length of hypotenuse of a right triangle
- Finding the length of a leg of a right triangle
- Solving word problems using Pythagorean Theorem

Lesson 272 – Congruent and Similar Triangles

- Identifying congruent triangles
- Determining whether two triangles are similar
- Setting up the proportions of corresponding sides in similar triangles
- Finding the length of an unknown side of one of two similar triangles
- Word problems involving similar triangles

Lesson 280 – Geometric Reasoning and Proof

- Recognizing a valid argument
- Identifying a statement that is correctly written in symbol form
- Evaluating truth tables
- Recognizing valid reasoning written in symbols
- Reading a Venn diagram

Standard III – Equations and Graphing

Lesson 300 – Expressions and Equations

- Writing a word expression as an algebraic expression
- Evaluating an algebraic expression
- Checking the solution of an equation

Lesson 310 – Algebraic Properties

- Identifying the reflexive, transitive, and symmetric properties of equality
- Identifying the substitution principle
- Identifying and using the commutative and associative properties
- Identifying and using the distributive property

Lesson 320 – Solving One-Step Equations

- Solving equations involving addition and subtraction
- Solving equations involving multiplication and division
- Solving equations with fractional coefficients

Lesson 330 – Solving Two-Step Equations

- Solving equations using more than one algebraic property
- Solving equations by combining like terms
- Solving equations that have the variable on both sides

Lesson 333 – Variation

– Writing ratios from word problems
– Solving ratios and proportions
– Solving direct, indirect, and joint variations for the constant of proportionality
– Identifying direct variations graphically and algebraically
– Identifying inverse variations graphically and algebraically
– Identifying/solving joint variations algebraically

Lesson 340 – Solving Inequalities

- Graphing inequalities
- Graphing compound inequalities
- Solving inequalities with one operation
- Solving inequalities with more than one operation
- Solving and graphing inequalities

Lesson 350 – Cartesian Coordinates

- Graphing ordered pairs of numbers
- Graphing linear equations
- Finding graphical solutions to linear equations

Lesson 360 – Properties of Lines and Segments

- Finding the slope of a line
- Finding the midpoint of a line segment
- Finding the distance between two points

Lesson 370 – Graphs of Linear Equations

- Graphing linear equations by plotting points
- Graphing horizontal and vertical lines
- Graphing linear equations using x- and y- intercepts
- Linear equations using slope and y-intercept

Lesson 373 – Functions and Relations

– Identifying relations, functions, function families
– Classifying relationships between two sets
– Determining the domain and range of a set
– Expressing a function using function notation
– Determining a function using vertical line test
– Solving functions using function notation
– Finding the domain and range of a function

Lesson 376 – Graphing Linear Inequalities

– Putting linear equations and inequalities in slope-intercept form (y = mx + b)
– Plotting the y-intercept and using slope to plot coordinate points
– Graphing linear inequalities on the Cartesian coordinate plane
– Determining whether to use a solid boundary line (≤, ≥) or a dashed boundary line (<, >)
– Determining whether to shade the half-plane above or below the boundary line

Lesson 380 – Determining the Equation of a Line

- Writing an equation in slope-intercept form
- Writing an equation in point-slope form
- Writing a linear equation given two points
- Writing a linear equation given the graph

Lesson 390 – Systems of Equations

- Solving system of linear equations by graphing
- Solving a system of linear equations by using the substitution method
- Solving a system of linear equations by using the linear combination method

Standard IV – Polynomial and Quadratic Equations

Lesson 400 – Adding & Subtracting Polynomials

- Classifying polynomial using number of terms
- Determining the degree of a polynomial
- Adding polynomials
- Subtracting polynomials
- Simplifying polynomial expressions containing both addition and subtraction

Lesson 410 – Multiplying Polynomials

- Multiplying a polynomial by a monomial
- Multiplying a polynomial by a polynomial
- Using FOIL method to multiply two binomials
- Squaring a binomial

Lesson 420 – Factoring Polynomials

- Factoring a GCF from a polynomial
- Factoring a polynomial by a common binomial
- Factoring a polynomial by grouping like terms
- Factoring the difference of two squares
- Factoring the sum or difference of cubes
- Factoring trinomials

Lesson 430 – Dividing Polynomials

- Dividing a monomial by a monomial
- Dividing a polynomial by a monomial

Lesson 440 – Solving Quadratic Equations

- Recognizing a quadratic equation written in standard form
- Recognizing and factoring perfect square trinomials
- Solving by factoring or using zero-product property
- Solving quadratic equations having no middle term
- Solving quadratic equations by completing square
- Solving quadratic equations using quadratic formula

Lesson 450 – Solving Word Problems

- Solving numerical word problems algebraically
- Solving geometric word problems algebraically

Standard V – Sets and Calculators

Lesson 500 – Sets

- Recognizing elements of sets
- Finding the intersection of two sets
- Finding the union of two sets
- Recognizing subsets
- Recognizing empty sets
- Using set notation
- Determining the equality of sets
- Interpreting a Venn diagram

Lesson 503 – Descriptive Statistics

– Computing or identifying range, mean, median, mode
– Interpreting data presented in graphs or tables
– Interpreting data presented in scatter plots
– Interpreting data presented in Venn diagrams

Lesson 509 – Applied Algebraic Concepts

– Solving problems involving compound interest
– Determining better investment choices
– Predicting population growth or decline using the Malthusian Model
– Solving problems involving linear programming
– Piecewise functions/greatest integer functions

Lesson 510 – Scientific Calculator

- Performing arithmetic operations
- Evaluating exponential expressions
- Evaluating square roots
- Finding a percent of a number

Science

Standard I – Science Thinking

Lesson 100 – Critical Thinking

- Defining the three kinds of communication used by scientists
- Enumerating guidelines for differentiating oral and written communication
- Stating reasons for using illustrations
- Defining classifying
- Classifying a list of items into two groups
- Accomplishing second stage classification of two groups
- Defining inference and prediction
- Understanding the use of computers, graphing calculators, biological research, and experimentation
- Understanding/interpreting a technical selection

Lesson 110 – Scientific Units

- Defining unit
- Defining the prefixes kilo- and centi-
- Converting units of measure
- Adding and subtracting units of measure
- Converting units using unit conversion factors
- Knowing unit abbreviations
- Multiplying and dividing units of measure
- Understanding mixed units
- Understanding squared units
- Employing significant figures and scientific notation in calculations
- Knowing what length, mass, volume, and temperature measure
- Understanding cubed units
- Measuring length, mass, volume, and temperature
- Using scientific notation and relative order of magnitude in experiments
- Understanding how to manipulate and analyze quantitative data using the SI system

Lesson 120 – History of Science

- History of science as a long, gradual process
- Understanding the origin of written language and its importance to science
- Understanding the pivotal role of mathematics in the evolution of science
- Listing important achievements in history of science
- Knowing who Copernicus was
- Knowing who Galileo was
- Knowing what astronomy is
- Knowing what physics is
- Knowing who Newton was
- Knowing who Benjamin Franklin was
- Knowing who Mendel was
- Knowing what biology is
- Knowing what genetics is
- Knowing who Charles Darwin was
- Knowing what chemistry is
- Knowing who Mendeleev was
- Knowing what the periodic table is
- Knowing who Becquerel was
- Understanding radioactivity
- Knowing who Marie and Pierre Curie were
- Knowing who Konrad Roentgen was
- Understanding x-rays
- Knowing who Alexander Graham Bell was
- Knowing who Albert Einstein was
- Knowing who Louis Pasteur was
- Understanding vaccinations
- Understanding DNA
- Understanding the space age
- Understanding satellites
- Understanding the information age

Lesson 130 – Unifying Concepts and Processes

- Understanding the difference between the natural world and the designed world
- Defining system, order, regularity, probability, prediction, organization, constancy, change, evolution, balance, form, and function
- Understanding specifics of the scientific method
- Stating the roles of observation, experiments, models, and simulations in hypothesis testing
- Understanding that science, technology, and products are all related in a continuous cycle

Lesson 140 – Science and Technology

- Defining technology
- Understanding where technology fits in to the designed world
- Recognizing relation of technology to science
- Identifying steps in development of innovations
- Listing examples of technological aids to science
- Explaining why science depends on technology
- Understanding how science has improved mathematics and how math and technology improve investigation and communication
- Knowing how the printing press, microscope, telescope, calculator, and computer helped improve science

Lesson 150 – Science in Personal and Social Perspectives: Part 1

- Understanding the benefits of advances in science and technology
- Understanding the impact of the Industrial Revolution on science
- Understanding that manufacturing provides us with factory-made products
- Knowing that because of the advances in agriculture, we now have plenty of food
- Understanding that because of labor-saving machines and devices, work is no longer as hard for humans or animals
- Knowing we have more leisure time to enjoy life through social activities, entertainment, hobbies, sports, etc., than in the past
- Understanding that due to advances in medical science, we now live healthier and longer lives
- Understanding that the Internet allows us to locate information in any part of the world in a few seconds
- Knowing that we are now a mobile and more-connected society

Lesson 151 – Science in Personal and Social Perspectives: Part 2

- Understanding that while science and technology have given us some great benefits, they sometimes create new problems
- Understanding why it is important to keep our environment safe
- Understanding pollution and how we are trying to prevent it
- Understanding the importance of preserving the ozone layer
- Knowing what contamination is
- Knowing that land and water can be contaminated by pesticides, herbicides, and fertilizers
- Understanding that scientists continually study ways to make motor vehicles safer
- Knowing that seat belts and air bags were developed to make driving safer
- Understanding that public health is another great concern for scientists
- Understanding that scientists monitor our food and drinking water
- Knowing that scientists are continually trying to find ways to make the Internet more secure
- Knowing about hackers and cyber crime

Standard II – The Science Process

Lesson 200 – What Is Science?

- Defining science as the human study of everything in the universe
- Understanding that science is both a body of knowledge and an investigative process
- Understanding that the body of knowledge of science is always changing
- Identifying the common goals of scientists: finding simple solutions, comprehensive results, clear and reliable explanations, and accurate predictions
- Enumerating and explaining the reasons humans study science
- Recognizing how scientific theory changes and how new theories replace old theories
- Understanding how a new theory replaces an old one: fit with other theories, explain a larger range of observations, and effectively predict new findings
- Stating examples of the contexts in which scientists work
- Identifying the steps scientists use to analyze their findings

Lesson 201 – The World of Scientists

- Knowing that scientists present their work and findings truthfully to the public
- Knowing that scientists have a sense of responsibility for their work

- Knowing that scientists allow other scientists to review their work
- Knowing that a positive attitude is important when studying science
- Knowing that scientists show a positive attitude toward learning and experiencing science, conserving natural resources, using scientific inquiry as a way of thinking and problem solving, and toward the importance of the contributions of science and technology in shaping society
- Knowing that scientists try to control conditions to get evidence
- Knowing what a variable is
- Knowing the ways ideas, opinions, and theories can be developed: using reasoning skills, engaging in library research, and discussing views with other students and experts
- Understanding that good research resolves competing explanations and shows where you agree or disagree with others
- Understanding that scientists have different needs based on the types of research they do, but all scientists collect information about the universe
- Knowing that there are many types of scientists, who collect information according to established rules all scientists accept
- Knowing that products are things we buy or use to make our lives easier and better
- Knowing the two types of research: basic, which is research to find new knowledge, and applied, which makes current knowledge useful in the world
- Understanding that scientists use their research to discover new knowledge, create new technologies, or improve new technologies
- Knowing that scientists need outside financial help, from government or private industries, to perform their research
- Knowing some of the various government departments that fund scientific research
- Knowing that governments work with colleges and universities to conduct research
- Understanding that scientific work has helped improve many facets of society
- Knowing that scientists with common goals often work together, but that they must also refrain from becoming biased
- Knowing that scientists search for the truth and must always remain objective

Lesson 210 – Scientific Inquiry

- Understanding that scientists conduct experiments using the scientific method
- Identifying the steps in the scientific method
- Knowing ways to approach the study of science
- Recognizing criteria for analyzing evidence
- Knowing the impact of technology on science
- Knowing more specific information about reliable scientific reference materials

Lesson 211 – Investigations and Experiments

- Defining experiment, hypothesis, testable prediction, operational definition, dependent variable, and independent variable
- Controlling for variables in an experiment
- Guidelines for gathering data in an experiment
- Analyzing data in the following ways: use experimental data to validate results, recognize biased data, and explain factors that produce biased data, learn how to defend the need for verifiable data, describe trends revealed by data, and summarize data.
- Reinforce with experiments.
- Understanding how to critique and dismiss arguments that use faulty data, misleading data, or incomplete use of numbers
- Understanding that performance testing is often conducted using small scale models, computer simulations or analogous systems to reduce the chance of system failure

Lesson 220 – Observing

- Defining observation
- Understanding that observations are made using all five senses
- Defining qualitative observation
- Identifying examples of qualitative observation
- Defining quantitative observation
- Distinguishing between examples of qualitative observations and quantitative observations
- Knowing what an estimate is
- Understanding the International System (SI)
- Knowing what a balance is
- Knowing what a barometer is

- Knowing what a thermometer is
- Distinguishing between observation and inference
- Stating an inference based on given information
- Understanding that math and science are used together to help people, even to save their lives
- Understanding that technology and mathematics are used to improve investigation and communication
- Understanding that scientists rely on technology to enhance gathering and manipulation of data
- Knowing that the value of a technology may differ for different people and at different times

Standard III – Chemistry

Lesson 300 – Matter

- Defining matter and molecule
- Recognizing the fundamentals of Avogadro's Law
- Understanding the difference between physical and chemical properties
- Knowing what hardness and texture are
- Identifying the physical and chemical properties of matter
- Distinguishing between mass and weight
- Defining volume and density
- Identifying the four states of matter
- Recognizing the fundamentals of the kinetic molecular theory
- Identifying basic characteristics of solids, liquids, and gases
- Understanding plasma
- Recognizing the fundamentals of Boyle's Law and Charles's Law

Lesson 301 – Working with Matter

- Understanding that matter can change from one state to another
- Stating the effect of heat, or the removal of heat, on a solid, liquid, or gas
- Knowing what a melting point is
- Knowing what a boiling point is
- Defining endothermic and exothermic processes
- Understanding the difference between physical and chemical changes
- Defining wave and particle
- Discussing how matter may act as a wave or particle
- Understanding what chemists do
- Knowing how chemistry relates to biology and physics

- Lesson 310 – The Atom
- Defining atom and element
- Understanding the impact of Democritus on the discovery of the atom
- Recognizing the main points of Dalton's atomic theory: all elements are composed of atoms that cannot be divided or destroyed; atoms of the same element are exactly alike; atoms of different elements are different; compounds are formed when the atoms of two or more elements are joined
- Describing Thomson's atomic model: the "plum pudding" model: In it, negatively charged particles are scattered throughout a positively charged material
- Describing Rutherford's atomic model: positively charged particles form the small, dense center of the atom. This positively charged center is called the nucleus. Negatively charged electrons are scattered outside the atom's nucleus.
- Defining atomic mass
- Knowing that different elements will have different atomic masses

Lesson 311 – Atomic Theory

- Understanding the impact of Thomson's and Rutherford's atomic models
- Describing the contribution of Robert Millikan: he measured the charge of an electron and an electron's mass
- Describing the contribution of Niels Bohr
- Describing how the electron microscope works
- Defining subatomic particles, proton, neutron, electron, atomic mass unit, atomic number, uncharged atom, ion, atomic mass, orbit, and isotope
- Calculating an atom's atomic mass
- Describing electromagnetic force, the strong force, the weak force, and gravity
- Understanding the concepts of repulsion and attraction
- Understanding the process of radioactive decay

Lesson 312 – Atomic Energy

- Understanding what nuclear fission is
- Knowing what an isotope is
- Knowing the common isotopes of uranium
- Knowing what mass numbers are
- Understanding radioactive decay
- Knowing what radiation is
- Understanding half-life
- Understanding chain reaction
- Understanding that the first atom bombs worked using nuclear fission
- Knowing that in 1945 the United States dropped devastating atom bombs on the Japanese cities of Hiroshima and Nagasaki which killed hundreds of thousands of people
- Knowing that nuclear fission of uranium atoms can also be used to make electricity
- Knowing that uranium is formed into long rods known as fuel rods
- Knowing what a nuclear power plant's core is
- Understanding that if the core gets too hot, a meltdown could occur
- Knowing what coolants, control rods, cadmium, and boron are and how they are used in nuclear power plants
- Understanding what a turbine is and how it produces electricity
- Understanding that there are positive and negative side effects of nuclear power
- Understanding what nuclear waste is
- Understanding what nuclear fusion is
- Knowing what deuterium and tritium are
- Knowing that fusion is used to make a hydrogen bomb
- Understanding what cold fusion is
- Understanding the dangers of exposure to various forms of energy

Lesson 320 – Elements

- Describing the fundamentals of the charge-cloud atomic model
- Determining the number of electrons in each energy level of an atom given the number of electrons the atom has
- Defining element
- Defining valence
- Understanding that the electron arrangement determines an element's chemical properties
- Describing how an atom becomes an ion
- Knowing how to calculate the number of neutrons an atom has
- Knowing an unbalanced charge causes electricity
- Understanding how electrons & protons determine chemical properties and potential energy
- Stating the octet rule and naming the exceptions to the rule

Lesson 321 – The Periodic Table

- Understanding what a chemical symbol is
- Explaining how the symbol for an element is assigned
- Knowing the contributions of Mendeleev and Moseley
- Knowing how the elements are organized on the periodic table
- Defining periodic law
- Defining groups and periods of the periodic table
- Identifying groups and periods on the periodic table
- Identifying noble gases, metals, nonmetals, and metalloids on the periodic table
- Identifying the information in a square on the periodic table
- Determining chemical properties of an element based upon the element's position in the periodic table
- Identifying groups of elements in the periodic table that tend to lose electrons
- Identifying groups of elements in the periodic table that tend to gain electrons

Lesson 330 – Compounds

- Defining compound, bonding, and ionic bond
- Writing the symbol for a given element's ion
- Writing the symbol for given ionic compounds
- Defining covalent bond
- Understanding the octet rule
- Defining single covalent bond, diatomic molecules, and double covalent bond
- Diagramming the combination of given pairs of elements

- Defining mole & Avogadro's Number
- Calculating moles using unit conversion factors
- Calculating the weight of a mole of a given compound
- Calculating moles given the weight of a compound
- Knowing the different properties of different compounds
- Knowing about the properties of ionic, covalent, and metallic compounds

Lesson 331 – Organic Chemistry

- Understanding the versatility of carbon
- Understanding the molecular structure of living things
- Understanding that the vast diversity of the properties of materials is due to variations in the forces that hold molecules together
- Understanding molecules, their properties, and how they are arranged
- Understanding organic molecules
- Understanding that organic compounds have such diverse properties and giving examples of how they have had an impact on society

Lesson 340 – Chemical Reactions

- Defining chemical formula
- Understanding that elements and compounds react in different ways to form different elements and compounds
- Outlining how to balance equations representing chemical reactions
- Knowing that equations must be balanced
- Defining functional group
- Defining combination, or synthesis, reaction
- Balancing an equation representing a combination reaction
- Defining decomposition reaction
- Balancing an equation representing a decomposition reaction
- Defining single replacement reaction
- Balancing an equation representing a single replacement reaction
- Defining double replacement reaction
- Balancing an equation representing a double replacement reaction
- Explaining and applying the Laws of Conservation of Matter and Energy to chemical reactions
- Understanding that there is a constant amount of energy and matter in the universe
- Defining equilibrium
- Understanding factors that affect the rate and equilibrium of reactions
- Understanding Le Chatelier's Principle
- Relating reactions to real-life situations that happen at home, in industry, or in entertainment
- Discussing catalysts, pressure, temperature, and how these affect chemical reactions

Lesson 341 – Solutions

- Understanding the difference between solution and suspension
- Defining suspension, solution, solvent, solute, miscible, solubility, saturated, and, molarity
- Recognizing factors that affect solubility
- Calculating and defining molarity
- Knowing how to calculate density and percent composition
- Understanding pH acids, pH bases, and comparing, contrasting, and measuring pH acids and bases
- Defining and explaining the uses of indicators
- Understanding solutions using the pH scale and relating the importance of pH to organism survival
- Understanding molecules, mixtures, and compounds

Standard IV – Physics

Lesson 400 – Introduction to Physics

- Defining force, speed, velocity, acceleration, and deceleration
- Defining and understanding Newton's first law, the law of inertia
- Identifying the units of measurement for velocity, acceleration, and deceleration
- Calculating velocity and acceleration
- Knowing Newton's second law, F = m x a
- Calculating force, acceleration, and mass
- Calculating weight (m x 9.8 m/s2)
- Understanding the differences between weight and mass
- Describing vectors

- Illustrating forces on an object with vectors
- Understanding gravity and frictional force
- Knowing Newton's third law, that every action has an equal and opposite reaction
- Knowing energy is fundamental to all scientific disciplines
- Understanding how physics applies to biology, chemistry, earth science, and other sciences
- Knowing what physics is, what techniques are appropriate to study it
- Understanding how math relates to physics
- Understanding that Earth's internal & external energy sources are forces
- Knowing most observable forces can be traced to electrical forces between atoms & molecules
- Recognizing the role that mathematics serves when solving problems in physics
- Understanding that any change in velocity is an acceleration
- Understanding that acceleration due to gravitational force is proportional to mass and inversely proportional to the square of the distance between the objects

Lesson 410 – Work and Power

- Defining work and joule
- Calculating work
- Describing the use of a lever to do work
- Calculating force when using a lever
- Describing the use of a pulley to do work
- Calculating force when using a pulley
- Defining power, watt, and kilowatt
- Calculating power
- Understanding the law of conservation of energy and transfer of energy

Lesson 420 – Electricity and Magnetism

- Understanding rules governing charged particles
- Defining electrically charged
- Describing charging by friction, contact, induction
- Defining conductor, insulator, static, voltage, volts, resistance, ohms, current, and amperes
- Understanding Ohm's law
- Calculating current, voltage, and resistance
- Defining fuse, grounded, direct current, and alternating current
- Describing the properties of a magnet
- Describing the Earth's magnetic field
- Understanding that as electrical charges oscillate, they create time-varying electric and magnetic fields that propagate away from the source as an electromagnetic wave
- Understanding the dangers of exposure to electricity and other forms of energy

Lesson 430 – Waves and Forces in Fluids

- Defining medium, transverse wave, amplitude, wavelength, frequency, and velocity
- Calculating the velocity, wavelength, and frequency of a transverse wave
- Knowing the definition of decibel
- Understanding frequency/pitch of sound waves
- Describing a compressional wave (compressions and rarefactions)
- Describing a sound wave
- Calculating wavelength of a sound wave
- Defining fluid and buoyant force
- Explaining three important principles which govern behavior of fluids: Archimedes' principle, Pascal's principle, and Bernoulli's principle
- Characterizing and differentiating electromagnetic and mechanical waves and their effects on objects as well as humans

Lesson 440 – Heat

- Defining temperature, thermal equilibrium, heat
- Distinguishing between temperature and heat
- Defining calorie, specific heat, absolute zero
- Identifying the effects of an increase and a decrease in temperature on a substance
- Describing conduction, convection, and radiation and how each spreads heat
- Understanding Thermodynamics and the three laws
- Knowing heat energy consists of ordered and disordered motions of colliding particles
- Understanding that temperature is a measure of the average translational kinetic energy of motion of the molecules of an object
- Understanding the total amount of usable energy always decreases, even though the total amount of energy is conserved

Standard V – Life Science

Lesson 500 – Introduction to Biology

- Understanding the significance of biology
- Enumerating the characteristics of living versus non-living things
- Enumerating the activities of a cell which contribute to the livelihood of organisms
- Understanding that cells exist within a narrow range of environmental conditions and changes to that environment will kill the cell or organism
- Understanding that biological systems obey the same laws of conservation as physical systems
- Knowing that biological systems are composed of cells just as all organisms consist of cells
- Understanding that life has a chemical basis

Lesson 501 – The Cell and Life

- Defining cell organelles (cell membrane, cell wall, cytoplasm, nuclear membrane, nucleus, vacuoles, ribosomes, mitochondria, endoplasmic reticulum)
- Explaining diffusion
- Distinguishing between permeable, impermeable, and selectively permeable
- Defining active transport
- Describing cellular respiration
- Defining photosynthesis and chloroplasts
- Describing the function of DNA, mRNA, and tRNA; explaining their role in protein synthesis and describing the double helix model
- Describing mitosis
- Describing meiosis
- Knowing the principles of the cell theory
- Explaining homeostasis, chemical synthesis, and essential energy
- Understanding enzymes and enzyme regulation
- Understanding the role of osmosis in living systems
- Diagramming the ATP energy cycle
- Understanding the role of minerals in living systems
- Understanding the structure of carbohydrates, lipids, and specific proteins
- Understanding that complex interactions among the different kinds of molecules in the cell cause distinct cycles of activity governed by proteins
- Understanding that cell behavior can be affected by molecules from other parts of the organism or even from other organisms
- Understanding that organisms respond to internal and external stimuli
- Defining amino acids and proteins

Lesson 510 – Heredity

- Defining trait, inheritable trait, genes, alleles, purebred, dominant allele, recessive allele, cross-pollination, crossbreeding, homozygote, recessive, phenotype, genotype, and hybrid
- Identifying Gregor Mendel and his contributions to the study of genetics
- Reading/interpreting a completed Punnett square
- Determining the probability of an offspring inheriting a certain characteristic from analyzing a completed Punnett square
- Defining crossing over, partially dominant trait, and polygenic trait

Lesson 511 –The Theory of Biological Evolution

- The impact of Darwin's work on the study of evolution
- Understanding that evolution is based on the four principles of overproduction, variation, competition, and selection
- Understanding natural selection
- Understanding gene pools, mutations, migrations
- Understanding evidence of physical, biochemical, and behavioral adaptations of plants and animals
- Patterns, methods, and rates of evolution
- Explaining the "punctuated equilibrium model"
- Experimental evidence about the origin of life
- Knowing specific organisms and their life cycles (Butterflies, fish, etc.)

Lesson 520 – Classification

- Defining the diversity of life
- Describing taxonomy
- Understanding what a taxonomist is
- Identifying Carolus Linnaeus
- Defining binomial nomenclature
- Identifying the levels and the order of biological classification (kingdom, phylum, class, order, family, genus, species)
- Explaining the term scientific name

- Arranging in order of appearance on Earth general categories of organisms
- Understanding five kingdoms of living things

Lesson 521 – Plants, Animals, and Viruses

- Explaining sexual and asexual reproduction
- Defining autotroph and heterotroph
- Identifying general characteristics of Kingdoms Plantae and Animalia
- Defining multicellular, chlorophyll, and photosynthesis
- Identifying general characteristics of bryophytes and tracheophytes
- Defining vascular, alternation of generations, gymnosperms, angiosperms, saprophyte, parasite, invertebrates, vertebrates, bilateral symmetry, and radial symmetry
- Identifying physical characteristics of flatworms, roundworms, segmented worms
- Identifying physical characteristics of mollusks, arthropods, echinoderms, mammals
- Defining exo- and endoskeleton, regeneration
- Defining viruses
- Understanding mutation

Lesson 522 – Protists, Monerans, and Fungi

- Identifying physical characteristics of protozoa and algae (Kingdom Protista)
- Defining pseudopod, cilia, and flagella
- Characteristics of pseudopod, cilia, and flagella
- Identifying physical characteristics of blue-green algae a bacteria (Kingdom Monera)
- Defining cocci, bacilli, and spirilla
- Identifying physical characteristics of organisms in the Kingdom Fungi (molds, mildews, and yeasts)
- Defining spores, hyphae, and basidium

Lesson 530 – Ecosystems

- Defining environment, population, community, ecosystem, climate, and biome
- Recognizing that water, heat, light, soil, and air are the elements of an organism's nonliving environment
- Identifying characteristics of the tundra, coniferous forest, temperate deciduous forest, grassland, desert, and rain forest
- Knowing what permafrost is
- Understanding the marine biome
- Understanding aquatic biomes
- Understanding the unique bonding and characteristics of water that make it essential for living systems: dissolving substances, interacting with other substances, moderating the effects of temperature change
- Defining biosphere
- Describing, comparing, and contrasting the dynamic interactions between divisions of biosphere: the physical environment, plant and algae life, animal life, and bacteria and fungi life

Lesson 531 – Habitats

- Identifying possible physical limiting factors in an ecosystem
- Defining population density
- Identifying density-dependent limiting factors
- Identifying density-independent limiting factors
- Defining habitat, niche, environmental resistance, biotic factors, and abiotic factors
- Identifying biotic and abiotic factors of environmental resistance
- Defining biotic potential, carrying capacity, interspecific competition, intraspecific competition, and diversity
- Describing importance of diversity in a habitat
- Describing the ways in which an ecosystem maintains balance (predation and selective breeding)

Lesson 532 – Life Systems

- Understanding the origin of energy for all organisms: food and sunlight
- Identifying types of animals by their eating habits
- Defining herbivores, carnivores, and omnivores
- Defining consumers and decomposers
- Recognizing and interpreting a food chain
- Recognizing and identifying energy cycle
- Understanding the flow of energy through an ecosystem made up of producers, consumers, and decomposers
- Interpreting food webs and food chains
- Identifying and enumerating the trophic levels of animals
- Understanding how species are interdependent and how these relationships contribute to the stability of the ecosystems

- Defining biodiversity and species and how the two are interconnected
- Defining estimate
- Understanding ideas of interdependence and extinction
- Identifying krill, algae, and global warming as interdependent units of the ecosystem of the waters off Antarctica
- Understanding the differences between stable and unstable ecosystems, including how an unstable ecosystem may collapse, or become unpredictable
- Understanding that all species represent a vital link in a complex web of interaction
- Recognizing Mount St. Helens as a volcano and its effects on the environment
- Understanding the necessity and benefits of biodiversity

Lesson 540 – The Human Body

- Defining tissue and organ
- Defining digestion and enzymes
- Describing skeletal system and its functions
- Defining ligament
- Describing muscular system and how it works
- Defining tendons, skeletal muscles, smooth muscle, and cardiac muscle
- Describing circulatory system and how it works
- Defining artery and vein
- Describing respiratory system and how it works
- Describing excretory system and how it works
- Defining urine and perspiration
- Describing nervous system and its functions
- Describing endocrine system and its functions
- Identifying characteristics that make humans different from other animals
- Explaining aerobic and anaerobic respiration in humans and extending this knowledge to other organisms
- Defining electrical and chemical body signals

Lesson 541 – Human Reproduction

- Defining hormones, testosterone, estrogen, reproductive system, sperm cells, testes, semen, penis, ovaries, egg cells, fallopian tubes, fertilization, uterus, vagina, and pregnancy
- Describing the reproductive system of males and females and how it functions in each
- Describing the three stages of pregnancy
- Defining zygote, embryo, and fetus
- Describing general characteristics of infancy, childhood, adolescence (puberty), adulthood, and aging, including menopause in women
- Understanding the risks of human pregnancy, including miscarriage

Lesson 542 – Advances in Health Science

- Understanding the immune system, how organisms cause disease and how the body fights them
- Defining infection, pathogen, skin, mucus, saliva, lymphatic system, white blood cells, lymphocytes, phagocytes, macrophage, B-cells, antibodies, T-cells, vaccine, smallpox, vaccination, influenza, rabies, and tetanus
- Understanding how technology is used to prevent and fight disease, and exploring major diseases and research
- Knowing that Edward Jenner discovered a vaccine to prevent smallpox
- Recognizing the work of Jonas Salk and Albert Sabin on curing polio
- Identifying ways to prevent the spread of disease
- Recognizing Ignaz Semmelweis' efforts to prevent the death of pregnant mothers
- Recognizing the work of Joseph Lister in preventing disease through cleanliness
- Knowing effects/origin of the Bubonic plague
- Recognizing the diseases spread by mosquitoes and how they can be prevented
- Knowing that you can help maintain health with fitness and diet habits
- Defining obesity and mental health
- Identifying the nutritional value of different types of vitamins

Standard VI – Earth and Space Science

Lesson 600 – History of Astronomy

- Knowing who Eratosthenes was
- Knowing who Hipparchus was
- Knowing what an eclipse is
- Knowing who Ptolemy was
- Understanding Ptolemy's geocentric model
- Knowing what orbit means
- Knowing who Nicholas Copernicus was

- Understanding Copernicus' heliocentric model
- Knowing what a telescope is
- Knowing who Johannes Kepler was
- Knowing who Tycho Brahe was
- Understanding Kepler's laws of planetary motion
- Knowing what the Milky Way Galaxy is
- Knowing what a galaxy is
- Knowing who Edwin Hubble was

Lesson 601 – The Universe

- Defining universe
- Describing the big bang theory
- Knowing who George Gamow was
- Knowing who Fred Hoyle was
- Describing the steady state theory
- Defining cosmologist
- Describing the formation of stars
- Defining galaxy and the Milky Way
- Defining Doppler effect, open universe theory, closed universe theory, dark matter, balanced universe theory, and oscillating universe theory
- Knowing who Johann Doppler was
- Describing the lifespan of a star
- Knowing what a protostar is
- Understanding the death phase of a star
- Defining red giant, white dwarf, neutron star, black hole, and nebula
- Comparing the sun to other, specific stars that represent various stages of stellar evolution; discussing stellar spectra, and elements
- Defining constellation, stellar equilibrium
- Understanding specific scientific evidence that supports the age and origin of the universe
- Understanding light year, parsec, and au
- Understanding the structure of the universe is the result o the interactions of matter and energy
- Understanding evidence that the universe contains all existing matter and energy
  Describing the role of hydrogen in the formation of all natural elements
- Knowing details about the organization of the universe, local group, nearby galaxies, super clusters, and quasars
- Knowing what the Magellanic Clouds are
- Knowing what Andromeda is

Lesson 602 – The Solar System

- Defining orbit
- Describing the formation of our solar system
- Describing the general physical characteristics of the planets in our solar system
- Describing asteroids, meteors, and comets
- Defining atmosphere
- Explaining the occurrence of ocean tides
- Defining Earth's axis
- Explaining the occurrence of seasons on Earth
- Describing the cycle of heat energy from the sun
- Describing lunar eclipse, total lunar eclipse, solar eclipse, and partial solar eclipse
- Demonstrating current knowledge about the laws of motion for orbiting bodies
- Explaining why earth seems to be the only planet capable of supporting life
- Relating fusion and fission to the energy given to the earth by the sun

Lesson 603 – Space Exploration Today

- Understanding the role of astronomers in space
- Defining Albert Einstein's theory of relativity
- Knowing who Albert Michelson was
- Identifying four major parts of the theory of relativity
- Defining constant, space-time, computer simulations, particle accelerator, subatomic particles, telescope, refracting, reflecting, convex lenses, focus, radio waves, Doppler Effect, redshift, visible spectrum, and rockets
- Recognizing importance of the Hubble Space Telescope
- Recognizing the importance of the Chandra X-Ray Observatory
- Understanding the space race between Russia and the United States
- Identifying two types of satellites: natural, artificial
- Understanding importance of Sputnik
- Recognizing achievements of space exploration: Yuri Gagarin, the Soyuz Capsule, Alan Shepard, Mercury Capsule, Saturn V, Apollo, Apollo 11, space shuttles, Challenger, Columbia, space probes, Voyager 2, Galileo, Huygens probe, the Mars Global Surveyor, Mars Pathfinder, rovers, Sojourner, Spirit, Opportunity
- Describing the optical telescope, radio telescope, X-ray telescope, and spectroscope and what they measure

Lesson 610 – History of Earth

- Describing how the Earth was formed
- Stating theories regarding the addition of water and atmospheric gases after Earth's formation
- Defining lava, volcanoes, and atmosphere
- Outlining the development of life on Earth
- Listing theories about how the Earth was created
- Identifying the "soup" theory
- Identifying the "life from space" theory
- Defining ultraviolet radiation, organic molecules, amino acids, prokaryotes, photosynthesis, blue-green algae, and eukaryotes
- Listing the differences between prokaryotes and eukaryotes
- Defining geology, geologic time, and eons
- Identifying the two eons, Precambrian and Phanerozoic Geologic time scale including eras, periods, and epochs and showing humanity's place in it
- Discussing the fossil
- Studying the record of the origin of life on Earth and the resulting changes in the amount of oxygen in the atmosphere
- Identifying three eras: Paleozoic, Mesozoic, Cenozoic
- Identifying the periods of the Paleozoic era
- Defining fossils, fossil record, and sediment
- Identifying impact of amphibians, trilobites, reptiles
- Defining extinction level event
- Defining Permian-Triassic Boundary and the K-T boundary
- Defining the Mesozoic era, or the Age of Reptiles
- Identifying three periods of the Mesozoic period
- Defining the Cenozoic era, the Age of Animals
- Identifying the epochs of the Cenozoic era
- Understanding the Holocene Era, and human involvement within it
- Defining radioactive dating, half-life, uranium, lead, carbon dating, and strata
- Understanding the contributions of Bertram Boltwood and Arthur Holmes
- Understanding the origins of names of periods, including the Cambrian and Cretaceous periods

Lesson 611 – Plate Tectonics

- Defining composition
- Identifying the layers of the Earth
- Defining inner core, outer core, mantle, upper mantle, lower mantle, silicates, asthenosphere, lithosphere
- Defining plastic
- Identifying the atmospheres
- Describing crustal plates
- Understanding nuclear fusion, radioactive decay, uranium, and convection currents
- Describing the theory of plate tectonics and the theory of seafloor spreading
- Describing an earthquake and continental drift
- Understanding the history of Pangaea
- Defining focus, epicenter, and margins (constructive, conservative, and destructive)
- Describing the result of a volcanic eruption
- Identifying seafloor spreading, the mid-Atlantic Ridge, the San Andreas Fault, and Richter scale
- Listing four ways plates interact with one another
- Stating an explanation for plate movement
- Knowing fusion and fission at the earth's core
- Explaining how radioactive decay and gravitational energy generate Earth's internal heat
- Understanding convection of Earth's internal heat as the power behind plate movement
- Defining volcano, lava, subduction, eruption, fault, earthquake, seismologist, seismograph, epicenter, and magnitude

Lesson 612 – Geologic Processes

- Defining mineral, igneous rock, magma, lava, granite, obsidian, sedimentary rock, and metamorphic rock
- Describing the cycle of rock formation on Earth
- Explaining metamorphism, weathering, erosion, deposition, melting, crystallization as well as specific examples of minerals and their classification due to hardness, luster, specific gravity streak, color, cleavage
- Listing causes of physical and chemical weathering
- Defining bedrock, topsoil, and subsoil
- Describing erosion by moving water
- Defining glacier
- Describing erosion by glacier and by wind

- Defining weathering, physical weathering, and chemical weathering
- Understanding the work of mineralogists
- Understanding the Mohs Hardness Scale
- Identifying the layers of soil, including humus
- Defining decomposers, pedology, and pedologists
- Identifying horizons of soil, including A, B, C, D
- Recognizing ill effects of over farming, soil erosion

Lesson 620 – Water Cycles and the Ocean

- Describing the water cycle
- Identifying places water can be located
- Defining evaporation, condensation, and precipitation
- Describing the water of an ocean
- Defining salinity
- Identifying problems scientists face in studying the ocean, including pressure and measurements
- Describing surface currents and deep ocean circulation
- Defining estuary

Lesson 621 – Weather and Climate

- Describing the troposphere, the stratosphere, the mesosphere, and the thermosphere
- Identifying the causes of wind
- Defining greenhouse effect and ozone layer
- Explaining importance of the ozone layer to Earth
- Defining air mass, front, weather, cold front, warm front
- Describing how fronts form
- Describing thunderstorms, tornadoes, and hurricanes
- Defining weather and climate
- Identifying the things that affect average temperature
- Describing how prevailing winds affect climate
- Knowing climactic patterns happen because of topography, rotation, solar radiation, wind, and ocean currents

Lesson 630 – Environmental Issues

- Understanding how humans impact ecosystems
- Recognizing that humans have put their environmental support system at risk through pollution and environmental hazards
- Identifying environmental issues that put people on a local and a global level in danger
- Listing the gases which help in creating the greenhouse effect
- Explaining dangers to the ozone layer, including smog, acid rain, and the burning of coal
- Explaining how pollutants affect living systems
- Understanding the necessity of irrigation for the food supply
- Understanding the necessity of fresh water
- Recognizing oil spills and pollution as destructive to the environment
- The EPA and its motto
- Recognizing education is the most important factor in the prevention and control of pollution
- Explaining how individuals can reduce and reverse impact on the environment through thinking, planning, collaboration, and action
- Understanding the importance of the Resource Conservation and Recovery Act

Lesson 640 – Earth's Natural Resources

- Defining resources
- Explaining the relationship between renewable and nonrenewable resources
- Discussing sustainable development to meet present and future needs
- Understanding that the distribution of the Earth's resources is not equal
- Analyzing different types of energy in terms of sources, limits, uses, and environmental impact
- Discussing how fossil fuels were formed and how they are used, including the multiple uses of petroleum and petroleum products
- Understanding how to conserve and preserve resources/recycling
- Risks involved with deforestation, overpopulation, and the long- and short-term consequences of resource management
- Recognizing why accountability toward the environment is essential for sustainability

Lesson 650 – Cutting Edge Science

- Knowing what bioethics is
- Knowing what cloning is
- Knowing what genetic engineering is
- Knowing what stem cell research is and that it is a contentious issue in bioethics
- Understanding Alzheimer's Disease, Parkinson's Disease, and Leukemia
- Knowing what environmental ethics are

(→) Lesson 650 – Cutting Edge Science

- Knowing who Rachel Carson is and what Silent Spring was responsible for
- Knowing what eutrophication is
- Understanding that physics has allowed society to create electricity to power lights, computers, and appliances; to use magnets to see inside the human body and cure diseases; to build rockets that can take us to the Moon; and to improve communication with the use of cellular phones, satellites, and the Internet
- Understanding that electricity can be produced from burning coal
- Understanding the following power sources: hydroelectric power, nuclear energy, and wind power
- Knowing what an MRI machine is and what it is used for
- Understanding that the study of earth science has allowed society to better predict and prepare for hurricanes and tornadoes; to determine the best places to build houses, stores, and bridges; to find important resources such as oil and coal under the ground; and to discover clues about the history of our planet
- Understanding that earth science helps determine good and bad places to build houses

Social Studies

Standard I – World Geography

Lesson 100 – Using Geographic Tools

- Identifying the equator
- Differentiating between longitude and latitude
- Using a globe to find longitude and latitude
- Identifying types of maps
- Using a map scale
- Using a compass rose
- Using a map grid
- Identifying the prime meridian
- Using a map legend

Lesson 110 – Continents and Countries

- Locating/knowing the seven continents
- Locating/knowing the countries of Europe
- Locating/knowing the countries of North America
- Locating/knowing the countries of Africa
- Locating/knowing the countries of South America
- Locating/knowing the country of Australia
- Locating/knowing the countries of Asia

Lesson 120 – Geographic Features

- Locating/knowing the five oceans
- Locating/knowing the major rivers
- Locating/knowing the major seas/lakes
- Locating/knowing the major mountains and mountain ranges

Lesson 130 – Physical Characteristics

- Understanding islands
- Understanding plains
- Understanding landforms
- Understanding cultural regions
- Knowing Earth's climate zones
- Understanding weather and climate
- Understanding peninsulas
- Understanding deserts
- Understanding swamps

Lesson 140 – Geography and Humans

- Understanding the greenhouse effect
- Knowing the physical characteristics of the environment
- Knowing the human characteristics of the environment
- Understanding natural hazards and disasters
- Understanding natural resources

Standard II – United States Geography

Lesson 200 – The States

- Knowing the fifty states of the U.S.
- Recognizing the fifty states on a U.S. map
- Knowing the capitals of the fifty states of the U.S.
- Knowing the six regions of the U.S.
- Knowing the border countries and the oceans surrounding the U.S.
- Knowing the major rivers of the U.S.
- Knowing the five major lakes of the U.S.
- Knowing the mountain ranges of the U.S.
- Recognizing the oceans, rivers, lakes, and mountain ranges on a U.S. map

Lesson 210 – Settlement and Expansion

- Understanding the Oregon Territory
- Understanding the Northwest Territory
- Understanding the Louisiana Territory
- Understanding the Mississippi Territory
- Understanding the territory ceded by Mexico
- Understanding manifest destiny
- Understanding the purchase of Alaska
- Understanding reasons for western settlement
- Understanding cultures
- Understanding settlement patterns

Standard III – World History

Lesson 300 – Early Civilizations

- Knowing how the abbreviations BC and AD are used in history
- Understanding human factors that led to civilization
- Understanding conditions that formed early communities
- Knowing about the spread of agricultural societies
- Understanding the Stone Age
- Knowing what cuneiform is
- Knowing what the Code of Hammurabi is
- Knowing what the Phoenician alphabet is
- Knowing who Cyrus the Great was
- Understanding the civilization of Mesopotamia

- Knowing who the Sumerians were
- Understanding the civilization of Egypt
- Knowing who the Assyrians were
- Knowing who the Babylonians were
- Knowing who the Phoenicians were
- Knowing what Pakistan is
- Understanding the Indus civilization
- Knowing the Nile River Valley

Lesson 301 – Aegean Civilizations: Ancient Greece and Rome

- Knowing where Aegean civilizations began
- Knowing some of the important Greek people and their areas of contribution
- Knowing how the Greek civilization spread to the ancient world and how it influenced history
- Understanding the Minoans and Crete
- Knowing who the Hellenes were
- Understanding Greeks city-states such as Athens and Sparta
- Knowing what an oligarchy is
- Understanding the development of democracy
- Knowing well-known Greek people and their areas of contribution such as: Philosophers (Plato and Aristotle); Mathematicians (Euclid and Archimedes); Historians (Thucydides and Herodotus); Physicians (Hippocrates and Galen); Writers (Homer, Euripides, Sophocles, and Aeschylus)
- Knowing who Alexander the Great was
- Knowing who Philip of Macedon was
- Knowing how the Romans became a world power
- Understanding how the Romans governed themselves and other people
- Identifying Rome's main contributions to civilization
- Knowing the reasons for the decline and fall of the Roman Empire
- Knowing who the Latins and the Etruscans were
- Understanding the Roman Republic including the Senate, the patricians, and the plebeians
- Knowing who Julius Caesar and Octavian were
- Understanding the split of the Roman Empire

Lesson 310 – Europe: The Dark Ages

- Knowing who Charles Martel was
- Understanding who the Angles and Saxons were
- Knowing who Pope Gregory was
- Knowing who Charlemagne was
- Understanding the feudal system
- Understanding the life philosophy of people during the Middle Ages
- Understanding the Holy Roman Empire
- Knowing the knights' role during the Middle Ages
- Knowing what troubadours were
- Understanding the belief during the Middle Ages of an Earth-centered system
- Understanding who the Vikings were
- Understanding early Christianity
- Understanding the belief during the Middle Ages that the earth was flat
- Knowing the contributions of monks during the Middle Ages
- Understanding the education of people during the Middle Ages
- Understanding the common beliefs about the universe during the Middle Ages
- Understanding the importance of Christian missionaries during the Dark Ages
- Understanding the importance and strength of the Roman Catholic Church
- Knowing who Mohammed was
- Knowing who the Franks were
- Knowing who the Huns were

Lesson 311 – Europe: The Crusades Through Political Change

- Knowing the purpose of the Crusades
- Knowing the major events of the Crusades
- Knowing some of the results of the Crusades
- Knowing who Pope Urban II was
- Knowing who Peter the Hermit was
- Understanding the reasons for the Magna Carta
- Understanding the major general provisions of the Magna Carta
- Understanding the historical significance of the Magna Carta
- Knowing who King John of England was
- Knowing who Henry III was
- Knowing the cultural changes that occurred during the Middle Ages
- Knowing some significant economic changes that occurred after the Crusades

- Understanding how the Black Death affected Europe
- Knowing the High Middle Ages lasted from about 1100 AD to about 1400 AD
- Understanding the role of monks and the Church
- Knowing works of literature written during the Middle Ages such as Beowulf, The Song of Roland, and the legends of King Arthur
- Understanding the development of universities
- Knowing the first university was founded in Bologna, Italy, around 1100 AD
- Knowing Dante wrote The Divine Comedy
- Understanding the Gothic style of architecture
- Knowing what illuminated manuscripts were
- Understanding the rise of the merchant class

Lesson 320 – Renaissance Europe: Part One

- Understanding some of the factors that contributed to the Renaissance
- Knowing some of the reasons for the spread of learning
- Understanding some of the changes in literature
- Understanding some of the achievements in art
- Understanding the major changes in religion
- Understanding the invention of the printing press by Johann Gutenberg and its contribution to the spread of learning
- Understanding Humanist writers like Erasmus and Dante
- Understanding the van Eyck brothers' use of oils mixed with paint
- Knowing some of the great Renaissance painters
- Knowing who Leonardo da Vinci, Raphael, and Michelangelo were
- Understanding the great advances in architecture
- Knowing who Martin Luther was
- Understanding the Protestant Reformation
- Knowing who John Calvin was
- Understanding the Counter Reformation
- Knowing some of the factors that contributed to economic developments during the Renaissance

Lesson 321 – Renaissance Europe: Part Two

- Understanding how scientific knowledge and thinking changed during the Renaissance
- Understanding some of the technological developments of the Renaissance
- Understanding advances made in ocean travel and mapmaking
- Understanding the changes in warfare including the use of gunpowder in the harquebus, the musket, and the cannon
- Knowing major political changes in continental Europe
- Knowing causes and results of the English Civil War
- Knowing the causes and results of the Glorious Revolution
- Understanding the rising merchant class
- Knowing who King Charles I was
- Knowing who Oliver Cromwell was
- Knowing who the Puritans were
- Knowing who James II was
- Knowing who William and Mary were

Lesson 330 – Colonizing the New World

- Understanding why European explorers went to explore the New World
- Understanding why Europeans searched for a westerly sea route to Asia for trade
- Knowing who Christopher Columbus was
- Understanding the Columbian Exchange
- Understanding the positive and negative impacts of the Columbian Exchange
- Understanding the impact the Europeans had on the Native American peoples
- Understanding the results of explorations that occurred during the Age of Discovery
- Knowing who King Ferdinand and Queen Isabella of Spain were
- Knowing Columbus' three ships, the Nina, the Pinta, and the Santa Maria
- Understanding cultural diffusion
- Knowing about conquistador Hernando Cortes
- Knowing about Francisco Pizarro
- Knowing about Ponce de Leon
- Knowing about Balboa
- Knowing about Ferdinand Magellan
- Understanding the Northwest Passage
- Knowing about John Cabot

- Knowing about Henry Hudson
- Understanding the English colony Jamestown in Virginia
- Knowing about John Smith
- Knowing about the Pilgrims
- Understanding the Plymouth Colony
- Knowing why various European groups settled the New World
- Understanding the Triangular Trade system
- Understanding the Puritans
- Understanding the Pilgrims
- Knowing who William Penn and the Quakers were
- Understanding which countries gained control of most of the North American land
- Understanding why Spain ceased to be a world power
- Understanding Queen Anne's War
- Understanding the French and Indian War

Lesson 340 – Upheaval and Changes in Europe: Part One

- Understanding how control of North America, involving the British, Dutch, French, and Spanish, has changed
- Understanding the French and Indian War
- Knowing what the 1763 Treaty of Paris was
- Understanding the effects of the American Revolution
- Knowing what the 1783 Treaty of Paris was
- Understanding the Louisiana Purchase
- Knowing who President James Monroe was and what he accomplished
- Understanding the Monroe Doctrine
- Understanding the main causes of the French Revolution
- Understanding the main events of the French Revolution
- Understanding the results of the French Revolution
- Knowing who Louis XVI was
- Understanding what the Estates General was
- Knowing what the Bastille was
- Understanding who the Jacobins were
- Knowing who Robespierre was
- Understanding the Reign of Terror
- Understanding the rise of Napoleon
- Understanding Napoleon's defeat
- Knowing who Lord Nelson was
- Understanding the Continental System
- Knowing what the Battle of Waterloo was

Lesson 341 – Upheaval and Changes in Europe: Part Two

- Understanding the purpose of the Congress of Vienna
- Understanding the results of the Congress of Vienna
- Knowing what the Quadruple Alliance was
- Knowing what the Quintuple Alliance was
- Knowing who Tsar Alexander I of Russia was
- Understanding the major reactions to the restrictions of the Congress of Vienna
- Understanding the major European powers that emerged after challenging the Congress of Vienna
- Understanding the unification of Germany
- Understanding Italy's independence
- Understanding the political changes in France
- Understanding the constitutional monarchy of Great Britain
- Knowing the changes the Industrial Revolution brought
- Understanding major scientific developments
- Understanding major developments in agriculture
- Knowing about steam engines, factories, mass production, railroads, and steamboats
- Knowing who Samuel F. B. Morse was and that he invented the telegraph
- Knowing who Alexander Graham Bell was and that he invented the telephone
- Understanding rotating crops improves the soil
- Understanding the enclosure system
- Knowing how farming equipment improved

Lesson 350 – World War I and Its Aftermath

- Understanding the alliances before World War II
- Knowing the sides during World War I
- Knowing how the countries joined World War I
- Understanding nationalism
- Understanding trench warfare
- Understanding how Fascist leaders gained control of European countries
- Russia's government after the Revolution

- Knowing the role of the U.S. in World War I
- Understanding who Mussolini was
- Understanding the sides of the Spanish Civil War
- Understanding the causes of World War I
- Knowing how World War I ended
- Understanding the technological improvements during World War I
- Understanding Japan before World War II
- Understanding the effects of the Great Depression
- Understanding German leadership after WWII
- Understanding Hitler's plans for Germany
- Understanding Hitler's ideas about race
- Knowing what concentration camps were
- Understanding the German and Italian alliance

Lesson 351 – World War II and Its Aftermath

- Understanding the sides in World War II
- Understanding the Battle of Britain
- Understanding the Soviets' role in World War II
- Knowing the leader of Germany
- Understanding the U.S. entry into World War II
- Understanding new technology used in World War II
- Understanding the German blitzkrieg
- Understanding the Battle of the Bulge
- Understanding the Normandy invasion
- Knowing why Japan surrendered
- Knowing how World War II ended
- Understanding the Battle of Midway
- Knowing what the United Nations is
- Knowing what the Cold War was

Lesson 360 – Europe after World War II

- Understanding the nations of Europe by the types of governments they started as a result of the war
- Understanding how the European nations became divided after the war
- Understanding how Germany and Berlin were divided
- Understanding the Communist attempt to take over Greece and Turkey
- Understanding the purpose of the Truman Doctrine
- Understanding the struggle for peace and stability in the world after World War II
- Knowing who Joseph Stalin was
- Knowing who George C. Marshall was
- Understanding the Marshall Plan
- Knowing what the Berlin Blockade was
- Knowing what the Berlin Airlift was
- Understanding the creation of NATO
- Knowing the Warsaw Pact
- Knowing some of the contributions of Mikhail Gorbachev to the decline of communism and the breakup of the Soviet Union
- Understanding the tension and unrest that led people to resist Communist rule
- Knowing major events in the fall of the Communist governments in Soviet-controlled nations
- Knowing what glasnost and perestroika were
- Knowing what Solidarity is
- Knowing who Lech Walesa is
- Understanding the Iron Curtain
- Understanding how decolonization of European colonies occurred
- Understanding the purpose of the European Union
- Knowing what the euro is and why it was created
- Knowing who Milosevic is
- Understanding what was done to stop Milosevic's ethnic cleansing in Yugoslavia
- Knowing what decolonization is
- Knowing what the common market is

Lesson 361 – Asia and the Middle East after World War II

- Understanding how China was lost to communism
- Understanding the main events of the Korean War
- Understanding the conflicts involving India, Pakistan, and Bangladesh
- Knowing what the 38th parallel is
- Understanding the main events of the Vietnam War
- Knowing what the Viet Cong were
- Knowing what the Tonkin Resolution was
- Knowing where Hanoi is and its importance
- Understanding the situation in the Arab world after World War II
- Understanding how religion is a factor in the governments of the Middle East
- Understanding the major events of the Israeli–Arab conflict

- Understanding what the Fundamentalist Islamic movement is
- Understanding the major post-World War II events involving Iraq, Afghanistan, and Iran
- Knowing what Pan-Arabism is
- Knowing what Zionism is
- Knowing what the Balfour Declaration was
- Knowing who Gamal Abdel Nasser was
- Understanding President Carter's efforts in the Camp David Accords
- Knowing who Saddam Hussein was
- Understanding the Persian Gulf War
- Understanding the Soviet invasion of Afghanistan
- Understanding the Iranian Revolution

Lesson 362 – Africa after World War II and Global Issues

- Understanding what happened in Africa when the European countries gave up their colonies
- Understanding the problems the new African states faced
- Knowing what apartheid was
- Understanding the significant developments in Latin America after World War II
- Understanding the Cuban Missile Crisis
- Understanding the major changes in the world economy after World War II
- Understanding the impact of multinational corporations
- Understanding the importance of key advances in science and technology
- Understanding the important environmental and health issues facing the modern world
- Understanding the causes of terrorism and describing the tactics terrorists use
- Knowing what the World Trade Organization is
- Knowing what OPEC is

Standard IV – United States History

Lesson 400 – Colonial America

- Understanding settlement of the Plymouth Colony
- Understanding settlement of the Roanoke Colony
- Understanding the settlement of Pennsylvania
- Understanding the settlement of Jamestown
- Understanding the settlement of Rhode Island
- Understanding the importance of colonial tobacco
- Understanding the Mayflower Compact
- Understanding colonial slavery
- Understanding the settlement of Delaware
- Understanding the settlement of the Massachusetts Bay Colony
- Understanding the Fundamental Orders
- Understanding the settlement of Georgia
- Understanding the settlement of Maryland
- Understanding the settlement of New York
- Knowing what an indentured servant was

Lesson 410 – The American Revolution

- Knowing who wrote Common Sense
- Understanding the basic ideas that fueled the revolutionary movement
- Understanding the acts leading to the Revolution
- Knowing who the Minutemen were
- Knowing who the Redcoats were
- Knowing the major generals of the American army
- Understanding the major battles of the Revolution
- Understanding who William Howe was
- Understanding the Declaration of Independence
- Knowing who the Sons of Liberty were
- Knowing who Samuel Adams was
- Knowing who the Loyalists were
- Knowing who the Hessians were
- Understanding who George Washington was
- Knowing about the winter at Valley Forge
- Understanding how the Revolution ended

Lesson 420 – A New Nation

- Understanding Washington's presidency
- Understanding political parties
- Understanding the Northwest Ordinance
- Knowing philosophers' influence on American thought
- Understanding John Adams' presidency
- Understanding the post-Revolution economy
- Understanding the Articles of Confederation
- Understanding the problems facing the government under the Articles
- Understanding the slavery issue
- Understanding the debate over representation

- Knowing the Bill of Rights
- Understanding Jay's Treaty
- Understanding the Enlightenment's influence on American thought
- Knowing Montesquieu's influence on the U.S. Constitution

Lesson 430 – Era of Expansion

- Understanding Thomas Jefferson's presidency
- Understanding the importance of the Louisiana Purchase
- Identifying Lewis and Clark and describing their journey
- Knowing the causes and the events of the War of 1812
- Explaining the importance of the Monroe Doctrine
- Knowing the key points of Jacksonian Democracy
- Knowing the impact of the Industrial Revolution on the United States
- Knowing the importance of slavery on the Southern economy
- Understanding the growing conflict between sections of the country
- Understanding westward expansion, manifest destiny, and their impact on Native Americans
- Understanding key social reforms of the time: suffrage, labor unions, abolition, women's rights, and public education

Lesson 440 – American Unrest

- Understanding the Mexican American War and explaining its causes and effects
- Knowing important Transcendentalists
- Knowing who Henry David Thoreau was and that he wrote Civil Disobedience
- Knowing who Ralph Waldo Emerson was
- Understanding Transcendentalists beliefs
- Understanding the impact of the Transcendentalists
- Knowing who James K. Polk was
- Knowing what the Oregon Territory was
- Knowing who General Winfield Scott was
- Knowing what the Treaty of Guadalupe Hidalgo was
- Understanding the New Mexico Territory
- Knowing what abolitionists were
- Understanding the Second Great Awakening and explain its causes and effects
- Understanding the status of women in the 18th century
- Understanding the movement for women's rights, important figures, and key events
- Understanding the Nativist movement and causes
- Knowing who Elizabeth Cady Stanton and Lucretia Mott were
- Knowing what the Declaration of Sentiments was
- Knowing who Susan B. Anthony was

Lesson 441 – A House Divided

- Knowing about the Second Great Awakening
- Knowing what the Abolitionist Movement was
- Knowing who William Lloyd Garrison was
- Knowing who Frederick Douglass was
- Knowing who Sojourner Truth was
- Knowing what the Underground Railroad was
- Knowing what the Free-Soil Movement was
- Expansion into California and New Mexico
- Understanding the California Gold Rush
- Knowing who John Sutton was

Lesson 450 – The Civil War

- Important events that led to the Civil War
- Understanding the many issues that divided the North from the South
- Knowing what popular sovereignty was
- Knowing what the Compromise of 1850 was
- Knowing what the Kansas-Nebraska Act was
- Understanding slavery and other factors that divided the South and the North
- Understanding formation of Republican Party
- Knowing who Abraham Lincoln was
- Understanding secession of South Carolina
- Knowing what the Confederate States of America were
- Knowing major figures of the Civil War
- Understanding the positive and negative effects of the Civil War and Reconstruction
- Knowing when the Civil War began
- Understanding the importance of Fort Sumter
- Knowing who Robert E. Lee was

- Understanding the Battle of Bull Run
- Understanding the Battle of Gettysburg
- Knowing who General Ulysses S. Grant was
- Knowing who John Wilkes Booth was
- Understanding Reconstruction
- Knowing what sharecroppers were
- Understanding the Black Codes
- Knowing what the Freedman's Bureau was
- Understanding the 13th Amendment
- Understanding the 14th Amendment
- Understanding the 15th Amendment
- Knowing what the Ku Klux Klan is

Lesson 460 – A Growing Nation

- Understanding the Homestead Act
- Understanding the rise of corporations
- Knowing the ideas of Washington and Du Bois
- Understanding Plessy v. Ferguson
- Understanding the importance of the transcontinental railroad
- Knowing why the West was finally settled
- Understanding immigration
- Understanding the importance of the West
- Understanding Jim Crow laws
- Understanding the Greenback, Populist Parties
- Understanding urbanization
- Understanding the defeat of the Native Americans on the Great Plains
- Defining entrepreneur
- Defining discrimination
- Defining racism
- Defining Transcontinental Railroad
- Understanding economic depression
- Understanding immigrant settlement
- Defining segregation
- Understanding conditions on the Great Plains

Lesson 470 – World War I and Its Aftermath

- Understanding Roosevelt's ideas about large corporations
- Knowing what an industrial society is
- Knowing what immigrants are
- Knowing what the Populist Party was
- Understanding the Progressive Movement
- Knowing what a capitalist system is
- Knowing who Theodore Roosevelt was
- Knowing who William Howard Taft was
- Knowing what monopolies are
- Knowing what the Bull Moose Party was
- Knowing who Woodrow Wilson was
- Understanding the causes of World War I
- Understanding U.S. involvement in World War I
- How the U.S. changed after World War I
- Knowing what nationalism is
- Knowing who Kaiser Wilhelm II was
- Knowing what the League of Nations was
- How the economy improved in the 1920s
- How American culture changed in the 1920s
- Why the stock market crashed in 1929
- Understanding the Great Migration
- Understanding the race riots
- Understanding welfare capitalism, consumer capitalism, credit, and advertising
- Understanding the Great Depression

Lesson 471 – The New Deal and World War II

- Understanding the New Deal and its projects
- Knowing who Franklin D. Roosevelt was
- Understanding the Great Depression
- Knowing what a welfare state is
- Knowing what the National Recovery Administration (NRA) was
- Knowing what the Agricultural Adjustment Administration (AAA) was
- Knowing what the Works Progress Administration (WPA) was
- Knowing what the Tennessee Valley Authority (TVA) is
- Knowing what the Security Exchange Commission (SEC) is
- Knowing what the Social Security Administration (SSA) is
- Understanding the causes of World War II
- Understanding the policy of isolation
- Knowing who Benito Mussolini was
- Knowing who Adolf Hitler was

· Knowing who the Axis Nations were
- Knowing who the Allied Nations were
- Understanding what happened at Pearl Harbor
- Understanding internment camps
- Knowing what D-Day was
- Understanding the Manhattan Project
- Knowing the importance of Hiroshima and Nagasaki
- Knowing what V-J Day was
- Understanding the International Monetary Fund, the World Bank, and the United Nations
- Understanding segregation and racism

Lesson 480 – The Cold War

- Understanding what the Cold War was
- Understanding what the United Nations' role was during the Cold War
- Understanding the Korean Conflict
- Understanding the U.S.'s containment policy
- Knowing what the Truman Doctrine and Marshall Plan were
- Understanding Berlin Blockade and Berlin Airlift
- Knowing what NATO is
- Knowing what the Warsaw Pact was
- Knowing who Harry S. Truman was
- Knowing who Joseph Stalin was
- Understanding the United Nations (UN)
- Understanding the Truman Doctrine
- Understanding the Marshall Plan
- Understanding the Berlin Blockade and the Berlin Airlift
- Knowing what the Berlin Wall was
- Understanding how nuclear technology affected the Cold War
- Understanding how nuclear weapons are used
- Understanding the Cuban Missile Crisis
- Knowing who Nikita Khrushchev was
- Knowing who Lyndon B. Johnson was
- Understanding the Vietnam War
- Understanding the Civil Rights Movement
- Knowing what the SCLC is
- Understanding Brown vs. Board of Education
- Understanding the Civil Rights Act of 1964
- Knowing about the Equal Rights Amendment
- Understanding the women's movement
- Knowing who Martin Luther King, Jr. was
- Understanding the Montgomery bus boycott
- Knowing who Rosa Parks was
- Understanding what the National Organization for Women (NOW) is
- Knowing what the Equal Rights Amendment (ERA) is
- Knowing who Richard M. Nixon was
- Knowing who Gerald R. Ford was
- Knowing who Jimmy Carter is
- Understanding the Iran hostage crisis
- Knowing who Ronald W. Regan was
- Knowing who Mikhail Gorbachev was and his importance to the end of the Cold War
- Understanding how the Soviet Union broke up
- Knowing how the Cold War ended

Standard V – Civics and Government

Lesson 500 – The Constitution

- Understanding Articles I – VII
- Understanding the Preamble
- Knowing the Bill of Rights
- Understanding double jeopardy
- Understanding the 13th Amendment
- Knowing the influences on the Constitution
- Understanding why amendments to the Constitution were allowed
- Knowing the number of Constitutional amendments
- Understanding how amendments are proposed
- Understanding the 15th Amendment
- Understanding the 18th and 21st Amendments
- Understanding what unreasonable search and seizure means
- Understanding the 19th Amendment
- Understanding the 24th Amendment
- Understanding the 26th Amendment

Lesson 510 – Branches of Government

- Understanding the powers of the President
- Understanding the powers of Congress
- Knowing the terms and requirements of senators
- Knowing the terms and requirements of Supreme Court Justices

- Understanding the 22nd Amendment
- Understanding the Great Compromise
- Understanding judicial review
- Knowing terms and requirements of the President
- Understanding how cases reach and are handled by the Supreme Court
- Knowing the terms and requirements of representatives
- Understanding how laws are passed
- Understanding shared powers

Lesson 520 – Political Systems and Governments

- Understanding democracy
- Identifying a unitary system of government
- Understanding the federal system in the U.S.
- Knowing that the U.S. is a democracy
- Knowing what an indirect democracy is
- Understanding direct democracy
- Knowing the Supremacy Clause
- Understanding a totalitarian government
- Defining a republican government
- Understanding anarchy
- Defining a confederal system of government
- Understanding the U.S. system of government
- Understanding the role of the Supreme Court

Lesson 530 – United States Citizenship

- Knowing how a person becomes a U.S. citizen
- Understanding the oath of allegiance
- Understanding rights/responsibilities of U.S. citizens
- Understanding interest groups
- Knowing requirements for citizenship application
- Knowing that citizens should be knowledgeable
- Knowing the characteristics of a good citizen
- Knowing the symbols of the U.S.
- Defining naturalization

Standard VI – Economics

Lesson 600 – Basic Economics

- Knowing a definition of economics
- Understanding basic economic concepts
- Understanding the concepts of scarcity, supply and demand, price, utility, and value
- Understanding opportunity costs
- Understanding the factors in production
- Understanding decision making using marginal cost and benefits
- Understanding production, distribution, and consumption
- Understanding specialization and division of labor
- Understanding interdependence

Lesson 610 – Economic Systems

- Knowing how to define economics
- Understanding the characteristics of traditional, command, market, and mixed economic systems
- Understanding market economies, command economies, and developing economies
- Understanding how different economies meet basic wants and needs over time
- Understanding strengths and weaknesses of the market economy with other economic models, using broad societal goals such as freedom, equity, security, employment, stability, and economic growth
- Understanding a mixed economy
- Understanding the United States economy
- Understanding the five basic principles of free enterprise

Lesson 620 – Financial and Economic Institutions

- Knowing how to define money
- Understanding how banks work
- Knowing what the Federal Reserve is
- Understanding how the Federal Reserve supports the U.S. economy
- Understanding the role of the federal government in the economy
- Understanding the reason for taxes
- Understanding the variety of taxes at the federal, state, and local levels of government
- Knowing what a corporation is
- Understanding the role of labor in the economy
- Knowing what unemployment is
- Understanding the purpose and goals of a labor union
- Knowing what the stock market is

Life Skills 25

Self-Development

Lesson 1 – Self-Concept

- Defining self-concept and related terms
- The role of self-concept in one's life
- Strategies for developing a positive self-concept

Lesson 2 – Self-Esteem

- Defining self-esteem
- The importance of self-esteem in everyday life
- Elements of one's own self-esteem
- Strategies for increasing self-esteem

Lesson 3 – Self-Confidence

- Defining self-confidence and related terms
- The origins of self-confidence
- Strategies for building self-confidence
- Strategies for maintaining self-confidence

Lesson 4 – Dealing with Emotions

- Defining common emotions
- Common negative emotions
- Strategies for dealing with negative emotions

Lesson 5 – Dealing with Conflict

- Defining conflict and related terms
- The origins of conflict and places where it occurs
- Reasons for dealing with conflict
- Strategies for resolving conflict

Lesson 6 – Dealing with Stress

- Defining stress
- The causes of stress
- How the body responds to stress
- Strategies for handling and preventing stress

Lesson 7 – Dealing with Criticism

- Defining criticism
- The appropriate attitude to take toward criticism
- The effects of criticism
- Destructive criticism
- Guidelines for handling criticism constructively
- Guidelines for offering constructive criticism to others

Lesson 8 – Dealing with Failure

- The causes and consequences of failure
- The negative effects of failure
- Identifying the areas of life in which one might fail
- How negative self-talk contributes to failure and strategies to avoid it
- Strategies and steps to take when one fails to reduce the impact of failure

Achieving Personal Goals

Lesson 9 – Identifying Interests

- Defining interest and related terms
- The role of interests in a happy life
- The basis upon which you identify your interests
- Your leisure interests
- Your educational interests
- Your occupational interests

Lesson 10 – Setting Your Priorities

- Defining priorities and related terms
- The importance of setting priorities in one's life
- Common priorities
- Identifying and ranking your own priorities

Lesson 11 – Setting Your Goals

- Defining goals and related terms
- The importance of setting goals
- Setting long-term goals
- Setting short-term goals

Lesson 12 – Making Decisions

- Defining decision
- The nature of decisions
- The importance of decisions relating to everyday life
- The pitfalls that result in poor decisions
- The steps in the decision-making process

Lesson 13 – Solving Problems

- Defining problem and related terms
- The nature of problems
- The steps in the problem-solving process

Lesson 14 – Planning

- Defining plan and planning
- The steps in the planning process
- The components of an action plan
- Contingency planning
- Resource management

Lesson 15 – Managing Time

- Defining time management and related terms
- The importance of time management
- Advantages of good time management
- Principles of good time management
- Common methods of time management

Lesson 16 – Thinking Clearly

- Defining clear thinking and related terms
- The importance of clear thinking
- Common errors in reasoning or in making judgments
- Guidelines for accurately evaluating information
- Guidelines for achieving results-oriented thinking

Lesson 17 – Systems Thinking

- Defining system and related terms
- Practical examples of systems
- Designing a hypothetical system
- How the concept of systems affects thinking

Interpersonal Skills

Lesson 18 – Listening Effectively

- Explaining the importance of effective listening skills
- Effective listening practices
- Techniques for effective listening
- Assessing your own listening habits
- Advantages of good listening skills

Lesson 19 – Speaking Effectively

- Barriers to effective speaking
- Steps for preparing to speak
- Guidelines for effective speaking
- Demonstrating effective speaking

Lesson 20 – Being Assertive

- Defining assertiveness
- Aggressive, passive, and assertive behavior
- Personal rights to be protected
- Principles of behavior
- Strategies to become more assertive

Lesson 21 – Relating to People

- The importance of relationship-building skills
- How relationships are built
- Characteristics of a positive person
- Reciprocity in relationships
- Communication in relationships

Lesson 22 – Following Directions

- Explaining the importance of following directions correctly
- Following oral directions correctly
- Following written directions correctly

Lesson 23 – Giving Directions

- Explaining the importance of being able to give directions
- Characteristics of good directions
- Clear, accurate, concise oral directions for location and procedure
- Clear, accurate, concise written directions for location and procedure

Lesson 24 – Identifying Work Styles

- Defining work style
- The significance of work styles
- Work styles found in the workplace
- The advantages of matching work styles to one's occupation
- Determining one's work style

Lesson 25 – Working Well with Teams

- Explaining the importance of working in teams
- Explaining how one can learn through others by working in teams
- Constructing teams
- Qualities of an effective team member

Workforce Development

Getting a Job (300s)

Lesson 310 – Making Career Decisions

- Identifying values
- Identifying needs
- Identifying interests
- Identifying skills
- Setting career goals

Lesson 320 – Looking for Employment

- Using networking in a job search
- Finding and using job information in the newspaper and on the Internet
- Using employment agencies in a job search
- Identifying other sources of job information
- Managing time on a job search

Lesson 330 – Preparing Your Resume

- Explaining importance of resume to job search
- Identifying the appropriate appearance for a chronological resume
- Presenting Contact Information on a resume
- Organizing qualifications (work experience, skills, education) on a chronological resume
- Defining functional and combination resumes
- Organizing and presenting business and personal references on a Reference Sheet

Lesson 340 – Applying for a Job

- Explaining how to apply for a job in person
- Explaining how to apply for a job by telephone
- Explaining how to apply for a job in writing
- Identifying the appropriate form and content of a letter of application

Lesson 350 – Completing a Job Application

- General guidelines for filling out a job application
- The Personal Information section
- The Education section
- The Employment History section
- The References section
- Explaining the meaning of one's signature on a job application

Lesson 360 – Understanding Your Job Interview

- Explaining the purpose of a job interview
- Identifying the appropriate personal appearance for a job interview
- Identifying the appropriate manners for a job interview

Lesson 370 – Making Your Interview Count

- Identifying the information and materials to gather for a job interview
- Answering common interview questions
- Identifying information to find during a job interview
- Identifying the appropriate way to ask for information during a job interview
- Identifying the positive and negative aspects of performance in an interview

Lesson 380 – Managing Your Job Search

- Defining a job search chart and explaining its use in managing one's job search
- Explaining how to maintain communication with network contacts during a job search
- Identifying people to whom one should send thank-you notes and when they should be sent
- Identifying the correct format and content of thank-you notes

Keeping a Job (400s)

Lesson 400 – Introducing the World of Work

- Explaining how to establish a working relationship with one's employer
- Identifying the characteristics of a strong work ethic
- Explaining employee-employer expectations
- Explaining how an employee's work is evaluated
- Defining job commitments

Lesson 410 - Maintaining Regular Attendance

- The importance of attending work regularly
- Explaining how to establish and maintain regular attendance at work
- Explaining the effects of poor attendance at work
- Explaining the appropriate ways to handle planned and unplanned absences from work

Lesson 420 – Being Consistently Punctual

- Defining consistently punctual
- Explaining how to establish and maintain a habit of punctuality at work
- Explaining the effects of being late
- Explaining the appropriate way to handle being late

Lesson 430 – Completing Tasks Effectively

- Explaining the importance of completing tasks effectively
- Explaining the appropriate way to follow directions on the job
- Explaining how to manage time at work
- Explaining how to develop an effective work plan

Lesson 440 – Communicating at Work

- Identifying the characteristics of effective communication in the workplace
- Explaining the importance of clear and appropriate communication at work
- Explaining how to speak clearly and appropriately at work
- Identifying listening skills that are useful at work
- Identifying the characteristics of clear and appropriate written communication at work
- Identifying reading skills that are useful at work
- Identifying nonverbal communication that is appropriate at work
- Identifying communication skills useful in solving problems at work

Lesson 450 – Demonstrating a Positive Attitude

- Explaining the importance of a positive attitude in the workplace
- Explaining how to show a positive attitude
- Explaining how a negative attitude contributes to problems at work
- Explaining how a positive attitude can help employees solve problems

Lesson 460 – Presenting an Appropriate Appearance

- Explaining the importance of an appropriate appearance at work
- Describing good personal hygiene
- Explaining how to change bad habits
- Describing the appropriate appearance for work

Lessons in Things (LiT)

Specialized Curriculum Architecture · A 21-Module Programmed Instruction Matrix

Lessons in Things (LiT) is an inquiry matrix grounded in observable physical phenomena, calibrated linguistic friction, and Hayakawa abstraction ladders. Each module is evaluated through three pedagogical frameworks: empirical science topics, reading and *Syntactistics* diagnostics, and cognitive lattice systems thinking.

Two-Axis Curriculum Architecture & Syntactistics Trajectory:

Truly progressive difficulty operates on two distinct axes. PACE-style chunked frames keep lesson prose near Flesch-Kincaid grade 8.5–9.8 (SRI 10.5–11.7), while abstraction climbs across the series and rises 141% from Tier 2 to Tier 3 on Hayakawa ladders. Mastery Tests carry the transfer reading load (SRI 11.4 → 13.3). Cause density (ρ = 0.01) and vocabulary variety (MATTR-50, ρ = -0.18) hold steady across the sequence.

- Tier 1 · Foundation (100–160): Physical Form-Motifs · Abs:Con Ratio: 0.90 · Lesson SRI: 10.5 (FK 8.5) · Mastery SRI: 11.4
- Tier 2 · Applied (200–250): Living Systems & Natural Math · Abs:Con Ratio: 1.14 · Lesson SRI: 11.7 (FK 9.8) · Mastery SRI: 13.1
- Tier 3 · Advanced (300–350): Symbolic Logic & Cybernetics · Abs:Con Ratio: 2.76 (+141% surge) · Lesson SRI: 11.4 (FK 9.5) · Mastery SRI: 13.3

Note: SRI = (FK + Gunning Fog + SMOG) / 3; Abstract-Concrete Word Ratio evaluated against Brysbaert Lexicon.

Division I: Physical Form-Motifs & Fundamental Mechanics

Lesson 100 – How to Recruit a Murder of Crows

Syntactistics Diagnostic: SRI 10.7 (FK 8.6 · GF 11.9 · SMOG 11.6) | Words: 2,012 | Mastery Tests (mean): SRI 10.7 (FK 8.8) | Reading Load Delta: -0.1 SRI (Δ FK: +0.2) | Abs:Con Ratio: 1.57 (Mastery: 1.33) | Practice Test: FK 7.0 | Vector: CDI:18 · ABI:61 · SRS:60 · LDB:39 · PCV:49 · RFI:84

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Animal Behavior, Ethology & Field Biology
- **Core Physical Phenomenon:** Corvid social structures, facial recognition capabilities, and food caching dynamics in urban and suburban crows (*Corvus brachyrhynchos*).
- **Corvid Taxonomy & Morphological Traits:** Distinguishing members of the Corvidae family (crows, ravens, magpies, jays, jackdaws) by cranial shape, plumage, vocal apparatus, and physical proportions.
- **Visual Cognition & Facial Memory:** Scientific documentation of corvid facial recognition; empirical evidence showing crows retain memory of individual human faces for several years (documented up to ~5+ in field studies).
- **Social Alarm Architecture & Sentinel Roles:** Acoustic properties of territorial calls, mobbing alerts, predator warnings, and sentinel shifts within foraging territories.
- **Foraging Ethology & Caching Dynamics:** Spatial memory mechanisms used by crows to hide, track, and recover nutritional caches; behavioral strategies for cache protection against theft.
- **Field Habitation Protocols:** Establishing predictable spatial grids and feeding schedules using high-value nutrition (unsalted in-shell peanuts, raw suet) while managing line-of-sight distance.
- **Intergenerational Transmission:** How threat assessments and food-source locations are culturally communicated from parent birds to fledglings across successive nesting seasons.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 8.2 | Lexile 920L | Voice: Direct 2nd Person
- **Syntactic Focus:** Sequential procedural transitions (*first, subsequent to, while maintaining*); active verbal phrases; antecedent-pronoun clarity.
- **Literal Comprehension (50%):** Identify explicit taxonomic classification of corvids; recall recommended initial food hierarchy (unsalted peanuts); identify initial non-threatening habituation distance.
- **Inferential Comprehension (30%):** Deduce why direct eye contact functions as a threat signal; infer the social mechanism of alarm sharing across non-present flock members; predict consequences of inconsistent feeding schedules.
- **Vocabulary in Context (10%):** Derive contextual meaning of *ethology*, *sentinel*, *habituation*, and *cache* from immediate sentence clues.

- **Synthesis / Evaluation (10%):** Evaluate the trade-offs between human intervention and natural foraging behavior.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Decentralized Social Memory & Risk Distribution
- **Level 1 (Concrete Anchor):** Wild crows recognizing human faces and transmitting threat/safety profiles across flocks without direct contact.
- **Level 2 (Mechanistic Rule):** Vulnerability of individual foragers to predators; limited line-of-sight observation.
- **Level 3 (Governing System Law):** Distributed Sentinel Networks: In complex environments, survival requires outsourcing risk surveillance to peer networks using standardized alarm protocols.
- **Level 4 (Cross-Domain Transfer):** Applying corvid alarm dynamics to open-source software vulnerability reporting and whistle-blower networks in corporate governance.
- **Transfer Scenario:** A cybersecurity firm wants to detect novel malware without installing invasive centralized tracking software on every employee laptop. How can they use the corvid "sentinel and social alarm" protocol to design a decentralized, peer-to-peer threat-warning system?

Lesson 110 – Yolk Lovers: The Science of Getting Eggs Right

Syntactistics Diagnostic: SRI 10.0 (FK 8.0 · GF 11.0 · SMOG 11.0) | Words: 5,017 | Mastery Tests (mean): SRI 11.3 (FK 9.8) | Reading Load Delta: +1.3 SRI (Δ FK: +1.7) | Abs:Con Ratio: 1.24 (Mastery: 1.17) | Practice Test: FK 8.9 | Vector: CDI:31 · ABI:69 · SRS:55 · LDB:28 · PCV:56 · RFI:87

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Culinary Thermodynamics, Organic Chemistry & Food Physics
- **Core Physical Phenomenon:** Protein denaturation and thermal phase transitions in avian eggs under precisely controlled temperature gradients.
- **Avian Egg Micro-Structure:** The physical and chemical components of the avian egg—the porous calcium carbonate shell, inner and outer albumen membranes, chalazae, and vitelline membrane.
- **Protein Molecular Denaturation:** The thermodynamic unfolding of coiled amino acid chains under kinetic energy transfer (heat) and subsequent intermolecular cross-linking.
- **Differential Coagulation Thresholds:**
- **Water Bath Thermodynamics:** Thermal conductivity of water vs. air; precision temperature equilibrium in sous-vide and poaching environments.
- **Rheological States of the Yolk:** Tracking viscosity changes from fluid liquid sol to viscous gel, firm custard, and chalky over-coagulated crumb.
- **Acid & Salt Catalysis:** How ionic salinity and low pH lower denaturation temperatures and accelerate protein coagulation kinetics.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 8.5 | Lexile 940L | Voice: Instructional 2nd Person
- **Syntactic Focus:** Quantitative temperature conditionals (*If the temperature rises above X, then Y occurs*); comparative adverbs (*gradually, abruptly, inversely*).
- **Literal Comprehension (45%):** Locate exact denaturation temperatures for ovotransferrin (62°C) vs. ovalbumin (80°C); state the chemical components of egg yolk.
- **Inferential Comprehension (35%):** Infer why boiling water produces rubbery egg whites while poaching at sub-boiling yields tender texture; explain why residual heat continues coagulation off the stove.
- **Vocabulary in Context (10%):** Define *denaturation*, *coagulation*, *viscosity*, and *solute* based on surrounding technical definitions.
- **Synthesis / Evaluation (10%):** Synthesize protein chemistry principles to evaluate culinary troubleshooting scenarios.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Threshold Dynamics & Non-Linear Phase Shifts
- **Level 1 (Concrete Anchor):** An egg yolk remaining liquid at 64°C, turning into a creamy spreadable gel at 65°C, and becoming a dry crumbly solid at 70°C.
- **Level 2 (Mechanistic Rule):** Specific kinetic thermal energy thresholds required to break non-covalent protein bonds and initiate irreversible cross-linking.
- **Level 3 (Governing System Law):** Tipping Point Transformation: Complex systems absorb linear inputs without visible change until a precise critical threshold is crossed, triggering sudden systemic restructuring.

- **Level 4 (Cross-Domain Transfer):** Applying protein denaturation kinetics to financial market liquidity freezes and viral social tipping points.
- **Transfer Scenario:** A community platform notices that adding new moderation rules causes zero observable change for months, but a single minor guideline update suddenly causes 40% of creators to abandon the platform overnight. Using the egg yolk denaturation threshold model, diagnose what occurred and why the management team misjudged the system.

Lesson 120 – The Crack in the Road: How Water Breaks the Rules

Syntactistics Diagnostic: SRI 9.9 (FK 8.1 · GF 10.8 · SMOG 10.9) | Words: 2,786 | Mastery Tests (mean): SRI 10.5 (FK 9.3) | Reading Load Delta: +0.6 SRI (Δ FK: +1.2) | Abs:Con Ratio: 0.61 (Mastery: 0.60) | Practice Test: FK 8.1 | Vector: CDI:57 · ABI:85 · SRS:54 · LDB:27 · PCV:51 · RFI:94

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Materials Science, Civil Engineering & Physical Hydrology
- **Core Physical Phenomenon:** The anomalous thermal expansion of water at 4°C, ice crystallization lattice volume increases, and the hydraulic destruction of asphalt pavement.
- **Anomalous Expansion of Water:** The unique physical behavior of water reaching maximum density at 3.98°C (4°C), below which it expands due to open hexagonal hydrogen-bonded crystal lattices.
- **Ice Crystallization Volume Increase:** The 9.05% volumetric expansion of water upon freezing from liquid to solid phase.
- **Hydrostatic Wedging Force:** Mechanical force exerted by confined freezing water (exceeding 2,000 atmospheres / 30,000 PSI), surpassing the tensile strength of concrete, asphalt, and natural bedrock.
- **Pavement Cross-Section Anatomy:** Structural layers of modern roadways: compacted subgrade, aggregate base course, binder course, and asphalt concrete wearing course.
- **Freeze-Thaw Cycle Degradation:** Seasonal cyclic mechanics: autumn water infiltration through microscopic surface fissures $\to$ winter freezing, expansion, and sub-base heave $\to$ spring thaw leaving subsurface voids $\to$ structural collapse under vehicular load (pothole formation).
- **Civil Engineering Mitigation Strategies:** Drainage slope engineering, permeable asphalt, polymer-modified bitumen binders, and sealant maintenance schedules.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 8.8 | Lexile 960L | Voice: Explanatory 3rd Person
- **Syntactic Focus:** Contrastive subordinating conjunctions (*whereas, while most substances, unlike other liquids*); physical state transition vocabulary.
- **Literal Comprehension (40%):** Identify the exact temperature of water's maximum density (4°C); state the volumetric percentage expansion of ice (9%).
- **Inferential Comprehension (40%):** Trace the causal chain from microscopic crystal lattice formation to macro-level asphalt structural collapse; infer why road maintenance fails when sub-base drainage is ignored.
- **Vocabulary in Context (10%):** Derive definitions for *hydrostatic*, *anomaly*, *subgrade*, and *tensile* from contextual usage.
- **Synthesis / Evaluation (10%):** Compare the destructive force of phase expansion with other weathering mechanisms.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Mechanical Advantage of Anomalous Micro-Expansion
- **Level 1 (Concrete Anchor):** Liquid water expanding by 9% upon freezing at 0°C, exerting over 30,000 PSI to crack heavy asphalt roadways.
- **Level 2 (Mechanistic Rule):** Confinement of expanding crystal lattices within rigid boundaries without drainage relief.
- **Level 3 (Governing System Law):** Confined Volumetric Rupture: When an expanding substance is trapped in an inelastic container, internal hydrostatic pressure scales exponentially until the container ruptures at its weakest fissure.
- **Level 4 (Cross-Domain Transfer):** Applying freeze-wedging mechanics to bureaucratic institutional paralysis, technical debt in software architecture, and the bursting of economic credit bubbles.
- **Transfer Scenario:** An engineering company has a core database that works perfectly under normal

traffic. However, during minor seasonal traffic surges, minor micro-errors that were ignored during the summer expand and lock the entire server infrastructure, causing a complete system outage. Map this failure to the freeze-thaw pothole cycle and propose a structural civil engineering-style remedy.

Lesson 130 – Basic Electricity and Circuits

Syntactistics Diagnostic: SRI 9.9 (FK 7.8 · GF 11.1 · SMOG 10.9) | Words: 1,772 | Mastery Tests (mean): SRI 9.8 (FK 8.0) | Reading Load Delta: -0.1 SRI (Δ FK: +0.2) | Abs:Con Ratio: 0.95 (Mastery: 0.76) | Practice Test: FK 6.6 | Vector: CDI:44 · ABI:76 · SRS:55 · LDB:35 · PCV:47 · RFI:86

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Electrical Engineering, Direct-Current (DC) Physics & Circuit Analysis
- **Core Physical Phenomenon:** The flow of valence electrons through conductive loops powered by chemical potential differences (galvanic cells).
- **Valence Electron Drift:** The physical definition of electrical conductors (copper, aluminum) having delocalized conduction-band electrons vs. insulators (rubber, glass, PVC).
- **The Closed Loop Requirement:** Why electric charge cannot flow continuously without an unbroken conductive path from potential source back to ground/return.
- **Fundamental Circuit Variables:**
- **Ohm's Law Relationships:** Mathematical and operational application of $V = I \times R$, $I = V / R$, and $R = V / I$.
- **Circuit Topologies:** Differential behavior of series circuits (single current path, additive resistance, voltage division) vs. parallel circuits (multiple branches, common voltage, inverse additive resistance).
- **Switching, Fuses & Failure States:** Open circuits, short circuits (zero-resistance bypass), thermal overload protection, and ground fault safety mechanics.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 8.9 | Lexile 980L | Voice: Direct 2nd/3rd Person Hybrid
- **Syntactic Focus:** Mathematical and propositional dependencies (*proportional to, inversely related, provided that the loop remains closed*).
- **Literal Comprehension (45%):** Recall the definition of conductors vs. insulators; identify units of measure for volts, amps, and ohms; state Ohm's law formula.
- **Inferential Comprehension (35%):** Deduce what happens to current across a parallel branch when one branch is severed; predict system failure from a zero-resistance short circuit.
- **Vocabulary in Context (10%):** Interpret the domain-specific meanings of *load*, *potential difference*, *ground*, and *continuity*.
- **Synthesis / Evaluation (10%):** Formulate a diagnostic protocol for identifying an open circuit in a multi-component series-parallel network.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Closed-Loop Conservation & Impedance Balance
- **Level 1 (Concrete Anchor):** A light bulb illuminating only when connected in an unbroken conductive loop between battery terminals.
- **Level 2 (Mechanistic Rule):** Electrostatic force equilibrium requiring charge conservation; electron flow ceases instantly upon any break in loop continuity.
- **Level 3 (Governing System Law):** Conservation of Closed-Loop Flow ($V = I \times R$): Functional work cannot be extracted from a flow system without both a potential gradient and a complete return circuit; resistance governs throughput.
- **Level 4 (Cross-Domain Transfer):** Applying DC circuit loop dynamics to organizational communication channels, capital flow recycling in local economies, and supply-chain return logistics.
- **Transfer Scenario:** A non-profit pours financial grants into a developing community to stimulate small businesses, but within 12 months, all the money has vanished and the local economy returns to stagnation. Using closed-loop circuit physics (voltage, load, and return ground), diagnose why the initiative failed to generate self-sustaining current.

Lesson 140 – Process Engineering: Fire, Fireworks, & Pyrotechnics

Syntactistics Diagnostic: SRI 11.2 (FK 9.0 · GF 12.6 · SMOG 12.1) | Words: 1,889 | Mastery Tests (mean): SRI 11.3 (FK 9.1) | Reading Load Delta: +0.0 SRI (Δ FK: +0.1) | Abs:Con Ratio: 0.76 (Mastery: 0.59) | Practice Test: FK 8.2 | Vector: CDI:86 · ABI:81 · SRS:63 · LDB:41 · PCV:52 · RFI:76

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Chemical Kinetics, Combustion Thermodynamics & Pyrotechnics

- **Core Physical Phenomenon:** Exothermic oxidation-reduction reactions, chemical reactant containment, and atomic emission spectra in pyrotechnic devices.
- **The Classical Combustion Triangle:** Fuel, oxidizer, and activation energy (heat); transition to the modern chemical combustion tetrahedron (incorporating uninhibited chain reactions).
- **Redox Chemical Reactions:** The simultaneous reduction (electron gain) of oxidizers (potassium nitrate KNO_3, potassium perchlorate KClO_4) and oxidation (electron loss) of fuels (sulfur, charcoal, aluminum powders).
- **Containment vs. Deflagration Mechanics:** The physical difference between open-air burning (deflagration) and confined rapid gas expansion producing shockwaves (detonation/propulsion).
- **Pyrotechnic Aerial Shell Anatomy:** Lift charge (black powder), time fuse, bursting charge, containment casing, and pyrotechnic pellet "stars."
- **Atomic Emission Spectroscopy:** The excitation of metal cation valence electrons to higher quantum orbitals and subsequent photon emission at specific wavelengths upon relaxation:
- **Kinetics Modulation:** Controlling burn rates through particle size, oxidizer-to-fuel surface contact area, and binder chemistry (dextrin, rice starch).

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 9.1 | Lexile 1000L | Voice: Expository 3rd Person
- **Syntactic Focus:** Simultaneous process clauses (*simultaneously, while, during which*); passive voice chemical descriptions (*electrons are transferred, energy is released*).
- **Literal Comprehension (40%):** List the components of the fire tetrahedron; identify which metal salts produce green (barium) vs. red (strontium) light.
- **Inferential Comprehension (40%):** Distinguish between the physical rate of deflagration vs. detonation based on containment pressure; infer why moisture ruins pyrotechnic ignition.
- **Vocabulary in Context (10%):** Contextually decode *redox*, *oxidizer*, *excitation*, *wavelength*, and *deflagration*.
- **Synthesis / Evaluation (10%):** Evaluate pyrotechnic shell failure modes from post-ignition blast pattern descriptions.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Containment Kinetics & Controlled Energy Dissipation
- **Level 1 (Concrete Anchor):** Black powder burning harmlessly in an open pile (deflagration) vs. shattering steel casing when confined (detonation).
- **Level 2 (Mechanistic Rule):** Surface-area oxidation rates, reactant proximity, and pressure-dependent thermal feedback.
- **Level 3 (Governing System Law):** Containment-Regulated Energy Release: The destructive or creative force of an exothermic reaction is determined not by the total fuel volume, but by the physical boundary conditions of its containment.
- **Level 4 (Cross-Domain Transfer):** Applying combustion containment to corporate PR crisis management, controlled thermonuclear fusion, and the release of political disclosures.
- **Transfer Scenario:** A company executive wants to announce an unpopular corporate restructuring. If they announce it in a closed all-hands meeting without an outlet, it will trigger an explosive backlash. Using pyrotechnic containment and venting principles, design a communication sequence that allows the emotional energy to dissipate safely.

Lesson 150 – Peanut Butter Plus Two: Colloid Physics & Rheology

Syntactistics Diagnostic: SRI 11.7 (FK 9.9 · GF 12.9 · SMOG 12.3) | Words: 3,975 | Mastery Tests (mean): SRI 13.0 (FK 11.5) | Reading Load Delta: +1.2 SRI (Δ FK: +1.5) | Abs:Con Ratio: 0.57 (Mastery: 0.78) | Practice Test: FK 9.0 | Vector: CDI:38 · ABI:86 · SRS:64 · LDB:32 · PCV:51 · RFI:88

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Food Rheology, Colloid Chemistry & Industrial Materials Science
- **Core Physical Phenomenon:** Solid-in-liquid suspensions, non-Newtonian viscosity, syneresis oil separation, and ingredient-gated emulsion stabilization.
- **Colloidal Suspension Classification:** Understanding peanut butter as a suspension of microscopic roasted peanut cotyledon solids

suspended within continuous-phase peanut lipids (triglycerides).

- **Non-Newtonian Fluid Mechanics:** Viscoelasticity and shear-thinning (pseudoplastic) behavior—why peanut butter resists gravity when at rest in a jar but shears easily under a spreading knife.
- **Syneresis & Phase Separation:** The thermodynamic settling of high-density solids over time, causing spontaneous exudation of unbonded surface oil (syneresis).
- **Lipid Crystallization & Hydrogenation:** The chemical mechanism of transesterification and partial/full hydrogenation: converting unsaturated oleic/linoleic fats into crystalline saturated stearic fats to create a 3D fat crystal network that traps free oil.
- **Emulsifier Chemistry:** The dual polar/non-polar molecular action of mono- and diglycerides, lecithin, and plant sterols in stabilizing lipid-solid interfaces.
- **Constraint-Based Formulation:** The precise rheological and functional effects of adding exactly two ingredients (e.g. sodium chloride for ionic bonding and honey/molasses for hygroscopic viscosity stabilization).

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 9.3 | Lexile 1020L | Voice: Procedural 2nd/3rd Person
- **Syntactic Focus:** Multi-tier procedural sequencing; conditional boundary clauses (*unless agitated, under high shear stress*).
- **Literal Comprehension (40%):** Identify the physical classification of peanut butter as a suspension; state the function of hydrogenated vegetable oils.
- **Inferential Comprehension (40%):** Explain why peanut butter resists gravity when inverted but spreads easily under a knife; infer why adding water to peanut butter causes sudden, counter-intuitive stiffening (seizing).
- **Vocabulary in Context (10%):** Differentiate *colloid*, *viscoelastic*, *syneresis*, and *non-Newtonian*.
- **Synthesis / Evaluation (10%):** Synthesize rheological principles to design an optimized 3-ingredient spread satisfying conflicting texture criteria.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Constraint-Based Optimization & Phase Stability
- **Level 1 (Concrete Anchor):** Natural peanut butter separating into solid sludge and surface oil; stabilizing into a permanent spread by adding exactly two ingredients.
- **Level 2 (Mechanistic Rule):** Thermodynamic entropy driving phase separation (syneresis); strict constraint of allowing only two additives.
- **Level 3 (Governing System Law):** Minimum Viable Stabilization: Maximizing functional structural integrity under severe boundary constraints through complementary stabilizing agents.
- **Level 4 (Cross-Domain Transfer):** Applying colloid stabilization to lean startup product design, minimal viable software architecture, and treaty stabilization in international diplomacy.
- **Transfer Scenario:** A project manager has an unstable remote team whose members are pulling apart into factional silos (phase separation). The manager is granted permission to introduce exactly two new organizational rules—no more. What two rules must they select to create structural cohesion without bureaucratic paralysis?

Lesson 160 – The Architecture of Disturbance: Ecological Succession

Syntactistics Diagnostic: SRI 10.3 (FK 8.1 · GF 11.4 · SMOG 11.3) | Words: 3,745 | Mastery Tests (mean): SRI 13.4 (FK 11.4) | Reading Load Delta: +3.1 SRI (Δ FK: +3.4) | Abs:Con Ratio: 0.58 (Mastery: 0.93) | Practice Test: FK 11.1 | Vector: CDI:27 · ABI:85 · SRS:57 · LDB:32 · PCV:51 · RFI:92

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Plant Biology, Urban Ecology & Soil Chemistry
- **Core Physical Phenomenon:** Ruderal plant colonization, mechanical soil cracking, pioneer species physiology, and secondary ecological succession in anthropogenic environments.
- **Anthropogenic Disturbance Ecology:** Physical characteristics of urban disturbances: soil compaction, thermal heat-island microclimates, alkaline pH from leaching concrete, and chemical runoff.
- **Pioneer Ruderal Plant Traits:** Physiological adaptations of initial colonizers (*Taraxacum officinale*, *Conyza canadensis*, *Ailanthus altissima*): rapid germination, deep taproots,

wind-dispersed pappus seeds, and extreme drought/heavy-metal tolerance.

- **Soil Cracking Mechanics & Seed Lodging:** How micro-cracks in asphalt and concrete act as moisture traps, thermal buffers, and dust collectors, creating pioneer micro-habitats.
- **Pedogenesis from Disturbance:** Mechanical root wedging breaking mineral substrates; organic matter accumulation from decaying root systems building initial humic topsoil.
- **Secondary Succession Pathways:** The predictable chronosequence: bare pavement fissure $\to$ microbial lichen crust $\to$ ruderal annual weeds $\to$ perennial grasses $\to$ woody shrubs $\to$ climax tree canopy.
- **Ecological Competition & Resource Allocation:** The shift in evolutionary strategies from r-selected species (high reproductive output, pioneer colonizers) to K-selected species (competitive endurance, climax canopy).

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 9.5 | Lexile 1050L | Voice: Observational Natural History
- **Syntactic Focus:** Temporal chronosequence markers (*subsequently, in the wake of, over decades, paving the way*); comparative botanical descriptors.
- **Literal Comprehension (40%):** Identify common pioneer ruderal species; recall physiological traits of taproot architecture and high seed dispersal.
- **Inferential Comprehension (40%):** Infer why anthropogenic disturbance mimics glacial retreat in primary succession; deduce how pioneer weeds alter soil chemistry to enable secondary colonizers.
- **Vocabulary in Context (10%):** Determine meaning of *ruderal*, *pedogenesis*, *succession*, *pioneer species*, and *humus*.
- **Synthesis / Evaluation (10%):** Evaluate the ecological impact of urban weed removal on soil stabilization and microclimates.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Pioneer Colonization & Substrate Preparation
- **Level 1 (Concrete Anchor):** Dandelions and crabgrass breaking through barren asphalt fissures, creating organic soil that allows complex plants to take root.
- **Level 2 (Mechanistic Rule):** Severe environmental hostility: lack of nitrogen, extreme heat, absence of organic humus.
- **Level 3 (Governing System Law):** Pioneer Succession Dynamics: Complex, mature ecosystems cannot be established directly on barren substrates; they require sacrificial pioneer agents to absorb shock, fracture barriers, and deposit baseline capital.
- **Level 4 (Cross-Domain Transfer):** Applying ecological succession to innovative product adoption (early adopters breaking market resistance for mainstream software), and establishing legal precedents in novel regulatory spaces.
- **Transfer Scenario:** A fintech company wants to launch an advanced decentralized financial tool in an emerging market where citizens have zero experience with digital banking. Instead of marketing the advanced tool directly, how can they deploy a "pioneer ruderal" product to prepare the consumer substrate?

Division II: Living Systems, Ecological Networks & Natural Math

Lesson 200 – The Brine Cabinet: Fermentation, Osmosis, & Biochemistry

Syntactistics Diagnostic: SRI 11.6 (FK 9.8 · GF 12.8 · SMOG 12.2) | Words: 2,983 | Mastery Tests (mean): SRI 14.2 (FK 12.4) | Reading Load Delta: +2.6 SRI (Δ FK: +2.6) | Abs:Con Ratio: 1.09 (Mastery: 1.57) | Practice Test: FK 9.3 | Vector: CDI:23 · ABI:73 · SRS:64 · LDB:40 · PCV:57 · RFI:89

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Microbiology, Biochemistry & Historical Food Preservation
- **Core Physical Phenomenon:** Lactic acid fermentation, osmotic cell plasmolysis, and microbiological succession in saline vegetable brines.
- **Osmotic Pressure & Plasmolysis:** The thermodynamic transport of water molecules across semi-permeable plant cell membranes from low solute concentration to high solute brine, resulting in turgor loss and cell crisping.
- **Salinity Thresholds in Fermentation:** The precise calibration of salt-to-water ratios (2.0% to 5.0% NaCl) required to inhibit putrefactive spoilage organisms and food-borne pathogens (*Clostridium botulinum*, molds) while allowing halotolerant bacteria to thrive.

- **Lactic Acid Bacteria (LAB) Microbial Succession:**
- **Anaerobic Vessel Dynamics:** Exclusion of atmospheric oxygen via fermentation crocks, water airlocks, or submerged weights to prevent aerobic mold (*Kahm* yeast) development.
- **Enzymatic Pectin Preservation:** The role of calcium ions (naturally present or added via grape/oak leaves containing tannins) in preventing polygalacturonase enzymes from softening vegetable cell walls.
- **Biochemical Nutrient Transformation:** Increased bioavailability of vitamins (C, B-complex), probiotic microbial biomass generation, and digestion-inhibiting phytate breakdown.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 9.8 | Lexile 1070L | Voice: Guided Scientific Inquiry
- **Syntactic Focus:** Biochemical equilibrium statements; dual-phase biological descriptions (*while X is suppressed, Y flourishes*).
- **Literal Comprehension (35%):** Identify the standard salinity percentage (2–5%) for vegetable fermentation; recall the sequence of bacterial succession (*Leuconostoc* followed by *Lactobacillus*).
- **Inferential Comprehension (40%):** Deduce why oxygen exposure causes surface mold rather than lacto-fermentation; infer the cellular mechanism of crispness preservation by calcium/tannin enzyme inhibition.
- **Vocabulary in Context (15%):** Contextually decode *osmosis*, *plasmolysis*, *anaerobic*, *halotolerant*, and *pectin*.
- **Synthesis / Evaluation (10%):** Analyze troubleshooting data from a spoiled fermentation batch to isolate the environmental breach.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Selective Environmental Filtering & Symbiotic Moats
- **Level 1 (Concrete Anchor):** Cabbage submerged in 3% salt water fermenting into nutritious sauerkraut while harmful rot and mold are largely suppressed when salt level and submersion are maintained.
- **Level 2 (Mechanistic Rule):** Pathogen vulnerability to osmotic shock and acidic pH; oxygen requirement of aerobic putrefactive microbes.
- **Level 3 (Governing System Law):** Selective Environmental Gating: A system protects itself and fosters productive symbiosis not by attacking individual invaders, but by establishing an environmental condition where only beneficial actors can survive.
- **Level 4 (Cross-Domain Transfer):** Applying osmotic brine barriers to corporate culture hiring filters, platform content moderation policies, and open-source contributor standards.
- **Transfer Scenario:** An online discussion community is being overrun by trolls and bad-faith actors. The moderators are exhausted from banning users manually. How can the platform use the "Brine Cabinet" principle to design an environmental barrier that naturally filters out trolls while allowing high-value contributors to thrive?

Lesson 210 – The Five-Knot Toolkit: Tensile Topology & Friction

Syntactistics Diagnostic: SRI 10.6 (FK 8.8 · GF 11.6 · SMOG 11.3) | Words: 2,417 | Mastery Tests (mean): SRI 9.1 (FK 7.8) | Reading Load Delta: -1.4 SRI (Δ FK: -1.0) | Abs:Con Ratio: 0.75 (Mastery: 0.70) | Practice Test: FK 5.9 | Vector: CDI:24 · ABI:81 · SRS:58 · LDB:37 · PCV:76 · RFI:89

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Mechanical Engineering, Marlinspike Seamanship & Applied Topology
- **Core Physical Phenomenon:** Spatial knot topology, capstan friction mechanics, tensile load distribution, and cordage mechanical integrity.
- **Cordage Fiber Physics:** Internal shear forces, compressive core stresses, and tensile breaking strengths in twisted vs. braided synthetic and natural fiber lines.
- **The Capstan Equation:** The exponential increase of frictional force as a rope wraps around an object: $T_{\text{load}} = T_{\text{hold}} \times e^{\mu \theta}$, where μ is the friction coefficient and θ is the angle of contact in radians.
- **The Five Core Knots & Mechanical Applications:**
- **Knot Efficiency & Tensile Reduction:** Empirical reality that knots typically reduce rope strength by roughly 20% to 50% due to acute bending radii concentrating stress along the outer fibers.
- **Jamming vs. Non-Jamming Geometries:** Structural difference between self-binding knots that bind permanently under high shock-loads vs. articulated knots engineered for rapid release after severe loading.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 10.2 | Lexile 1100L | Voice: Technical Mechanical Prose
- **Syntactic Focus:** Spatial prepositional complexity (*passed around the standing part, through the bight, under load, forming a helix*); structural cause-and-effect clauses.
- **Literal Comprehension (35%):** Match each of the five knots to its specific functional category (loop, hitch, bend, binding, friction); recall the Capstan effect.
- **Inferential Comprehension (40%):** Infer why a square knot capsizes under dynamic or unequal load; deduce why knots weaken overall rope tensile strength by creating acute shear angles.
- **Vocabulary in Context (15%):** Decode specialized nautical and topological terms: *bight*, *standing part*, *working end*, *capsizing*, and *topology*.
- **Synthesis / Evaluation (10%):** Select and justify the optimal knot selection for complex, multi-vector rigging scenarios.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Topological Dissipation & Friction Multiplication
- **Level 1 (Concrete Anchor):** A 150-pound sailor holding a 10,000-pound ship mooring line using three wraps around a capstan winch; tying a bowline that resists jamming under tension.
- **Level 2 (Mechanistic Rule):** Limits of human physical strength; extreme tensile stress causing fibers to shear or slip.
- **Level 3 (Governing System Law):** Exponential Friction Multiplication ($T = T_0 e^{\mu\theta}$): Overwhelming linear forces can be controlled with far less holding force and dissipated by redirecting them through curved geometric contact angles.
- **Level 4 (Cross-Domain Transfer):** Applying the Capstan equation to contract negotiation leverage, legal indemnity clauses, and emotional judo in executive dispute resolution.
- **Transfer Scenario:** A small subcontractor is facing an aggressive, multi-billion-dollar client demanding unfulfillable deadlines. The subcontractor cannot overpower the client legally or financially. Using the Capstan friction and Bowline topology principles, how can the subcontractor structure the project contract to dissipate the client's pressure?

Lesson 215 – Bees: The Connector Swarm: Stigmergy & Architecture

Syntactistics Diagnostic: SRI 13.1 (FK 10.9 · GF 14.7 · SMOG 13.6) | Words: 6,208 | Mastery Tests (mean): SRI 14.4 (FK 12.6) | Reading Load Delta: +1.4 SRI (Δ FK: +1.6) | Abs:Con Ratio: 1.22 (Mastery: 1.25) | Practice Test: FK 10.0 | Vector: CDI:29 · ABI:69 · SRS:73 · LDB:29 · PCV:60 · RFI:85

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Entomology, Structural Architecture & Collective Intelligence
- **Core Physical Phenomenon:** Honeycomb wax construction, hexagonal close-packing geometry, and decentralized stigmergic coordination in *Apis mellifera*.
- **Beeswax Biochemistry & Secretion:** Glandular secretion of wax scales from abdominal sternites 4 through 7; enzymatic processing and physical kneading with mandibular secretions.
- **The Hexagonal Isoperimetric Solution:** Why hexagons are the mathematically optimal shape for dividing a two-dimensional surface into equal areas with the minimum total perimeter (The Honeycomb Conjecture, proved by Thomas Hales).
- **Comb Three-Dimensional Architecture:** The rhombic dodecahedral trihedral base connecting opposing layers of cells; the 9° to 14° upward tilt of cells preventing liquid honey from spilling before capping.
- **Thermodynamic Hive Regulation:** Collective hive homeostasis: evaporative cooling via fanning behavior during high ambient heat; metabolic shivering of flight muscles within a tightly packed winter cluster to maintain brood temperatures at $34.5^\circ\text{C}\pm1^\circ\text{C}$.
- **Decentralized Stigmergy:** How individual workers do not follow centralized plans, but rather modify their local physical environment (wax wall thickness, pheromone scent gradients), which in turn triggers specific predictable construction responses in neighboring workers.
- **The Waggle Dance Vector Navigation:** Polar coordinate communication: translating angular orientation relative to gravity into solar azimuth flight angles, and waggle duration into flight distance metrics.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 10.5 | Lexile 1120L | Voice: Analytical Systems Biology

- **Syntactic Focus:** Decentralized agent descriptions; reciprocal relational syntax (*each worker responds to local cues, thereby altering the structure that prompts the next worker*).
- **Literal Comprehension (30%):** Identify the anatomical source of beeswax (abdominal glands); state the mathematical theorem governing hexagonal tessellation (Honeycomb Conjecture).
- **Inferential Comprehension (45%):** Explain how decentralized stigmergy achieves architectural uniformity without central leadership; infer how hive fanning maintains homeostasis across ambient temperature swings.
- **Vocabulary in Context (15%):** Define *stigmergy*, *tessellation*, *superorganism*, *isoperimetric*, and *homeostasis*.
- **Synthesis / Evaluation (10%):** Synthesize swarm communication principles to evaluate distributed human decision-making systems.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Stigmergic Coordination & Geometric Efficiency
- **Level 1 (Concrete Anchor):** 50,000 honeybees constructing a geometrically flawless hexagonal comb and regulating hive temperatures without an architect or centralized command.
- **Level 2 (Mechanistic Rule):** Metabolic expense of wax production (requiring 8 oz of honey per 1 oz of wax); individual bee cognitive simplicity.
- **Level 3 (Governing System Law):** Stigmergic Self-Organization & Isoperimetric Efficiency: Autonomous agents operating under local, passive environmental cues will spontaneously self-assemble global, optimal structures that minimize resource consumption.
- **Level 4 (Cross-Domain Transfer):** Applying stigmergy to Wikipedia article curation, decentralized blockchain protocol governance, and disaster-relief volunteer mobilization.
- **Transfer Scenario:** A humanitarian aid agency needs to organize 5,000 unvetted spontaneous volunteers during an earthquake aftermath without creating a bureaucratic bottleneck. How can they use stigmergic communication (environmental traces rather than direct managerial commands) to direct volunteer labor?

Lesson 220 – Mycology of the Forest Floor: The Mycorrhizal Web

Syntactistics Diagnostic: SRI 12.5 (FK 10.9 · GF 13.7 · SMOG 12.9) | Words: 2,389 | Mastery Tests (mean): SRI 14.6 (FK 13.3) | Reading Load Delta: +2.1 SRI (Δ FK: +2.4) | Abs:Con Ratio: 0.95 (Mastery: 1.15) | Practice Test: FK 10.1 | Vector: CDI:22 · ABI:76 · SRS:69 · LDB:38 · PCV:60 · RFI:78

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Mycology, Soil Ecology & Subterranean Bio-Economics
- **Core Physical Phenomenon:** Fungal hyphal growth morphology, mycorrhizal symbiosis, and subterranean nutrient-carbon exchange networks.
- **Hyphal Biology & Mycelial Matrices:** Single-cell thick chitinous hyphae, apical tip growth mechanics, septate divisions, and explosive surface-area-to-volume ratios maximizing nutrient absorption.
- **Ectomycorrhizae vs. Endomycorrhizae (Arbuscular):**
- **Subterranean Resource Exchange Currencies:** The bidirectional market: plants providing up to 20–30% of their photosynthesized fixed carbon (sugars, lipids) to fungi in exchange for fungal delivery of bioavailable phosphorus (PO_4^{3-}), nitrogen, and water.
- **The Common Mycelial Network (CMN):** Hyphal bridges physically connecting separate individual plants across species boundaries; subterranean transfer of defense signals and carbon subsidies from mature trees to shaded seedlings.
- **Fungal Enzymatic Lignocellulose Breakdown:** Secretion of extracellular lignocellulolytic enzymes (laccases, peroxidases, cellulases) capable of cleaving rigid phenolic wood polymers into organic soil humus.
- **Dynamic Routing Economics:** Fungal reallocation of scarce minerals away from carbon-poor plants toward high-yield carbon producers, demonstrating biological market dynamics without central control.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 10.8 | Lexile 1150L | Voice: Ecological Systems Analysis
- **Syntactic Focus:** Mutualistic relational clauses; transactional syntax (*in exchange for, subsidized by, reallocated toward*); complex biological nominalizations.
- **Literal Comprehension (30%):** Distinguish between ectomycorrhizal (external sheath) and

arbuscular endomycorrhizal (intracellular) structures; recall the specific nutrients traded (carbon vs. phosphorus/nitrogen).

- **Inferential Comprehension (45%):** Infer how subterranean mycelial networks reallocate resources from healthy canopy trees to shaded saplings; explain how plants transmit predator defense signals through hyphal conduits.
- **Vocabulary in Context (15%):** Contextually decode *hyphae*, *mycelium*, *symbiosis*, *arbuscular*, and *lignocellulose*.
- **Synthesis / Evaluation (10%):** Evaluate the ecological ramifications of clear-cutting on subterranean fungal infrastructure.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Subterranean Resource Routing & Mutualistic Trade
- **Level 1 (Concrete Anchor):** Fungal hyphae trading phosphorus and nitrogen to mature trees in exchange for carbon sugars, and dynamically routing subsidies to struggling shaded saplings.
- **Level 2 (Mechanistic Rule):** Plants cannot mine mineral phosphorus; fungi cannot perform photosynthesis; local resource availability is uneven.
- **Level 3 (Governing System Law):** Decentralized Resource Arbitrage: Highly connected, distributed transit networks optimize total ecosystem health by taxing nutrient surpluses in high-production nodes to subsidize vulnerable, strategic reserve nodes.
- **Level 4 (Cross-Domain Transfer):** Applying the mycorrhizal carbon market to cloud computing bandwidth load balancing, cross-department corporate R&D funding, and international currency liquidity swap lines.
- **Transfer Scenario:** A global manufacturing corporation has profitable legacy business units and cash-starved exploratory innovation labs. The corporate budgeting committee consistently starves the labs. Using the mycorrhizal exchange network model, design a dynamic, automated resource-routing mechanism that keeps the entire corporate ecosystem resilient.

Lesson 230 – Lost Cryptography: Shift Ciphers & Information Entropy

Syntactistics Diagnostic: SRI 11.5 (FK 9.7 · GF 12.7 · SMOG 12.2) | Words: 3,620 | Mastery Tests (mean): SRI 12.7 (FK 11.0) | Reading Load Delta: +1.2 SRI (Δ FK: +1.4) | Abs:Con Ratio: 1.60 (Mastery: 1.30) | Practice Test: FK 8.0 | Vector: CDI:24 · ABI:60 · SRS:63 · LDB:32 · PCV:58 · RFI:58

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Cryptanalysis, Historical Linguistics & Information Theory
- **Core Physical Phenomenon:** Substitution cipher algorithms, polyalphabetic arrays, natural language frequency distributions, and entropy reduction.
- **Classical Monoalphabetic Substitution:** Caesar cipher mechanics ($C \equiv P + k \pmod{26}$); single-alphabet substitution arrays and transposition methods.
- **Natural Language Statistical Invariance:** The unalterable statistical fingerprint of natural human language: single-letter frequency distribution in English ($E \approx 12.7\%$, $T \approx 9.1\%$, $A \approx 8.2\%$, down to $Z \approx 0.07\%$).
- **Frequency Analysis Breaking Techniques:** Al-Kindi's 9th-century method: using digraphs (TH, ER, IN), trigraphs (THE, AND), letter positioning (initial/final consonants), and letter-count frequency histograms to decrypt encrypted text without key possession.
- **Polyalphabetic Encryption: The Vigenère Square:** Using a 26x26 Caesar alphabet grid with a repeating keyword to flatten single-letter frequency distributions across multiple cipher alphabets.
- **Cryptanalysis of Polyalphabetic Systems:** The Kasiski examination: identifying recurring identical ciphertext sequences, calculating greatest common divisors of interval spacing to determine keyword length, and breaking the cipher into isolated Caesar ciphers.
- **The One-Time Pad & Information-Theoretic Security:** Shannon's entropy theorem: why a purely random, non-repeating key used only once and kept completely secret provides mathematically unbreakable confidentiality.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 11.1 | Lexile 1180L | Voice: Mathematical Cryptanalysis
- **Syntactic Focus:** Mathematical modular conditionals (*where each character is shifted by an

index of k modulo 26*); algorithmic propositional framing.

- **Literal Comprehension (30%):** Recall the mechanics of the Caesar shift cipher; state the highest-frequency letters in the English language (E, T, A, O, I, N).
- **Inferential Comprehension (45%):** Deduce why monoalphabetic ciphers fail against statistical frequency analysis regardless of alphabet complexity; infer how the Kasiski examination reveals polyalphabetic keyword length through repeating interval factors.
- **Vocabulary in Context (15%):** Interpret information-theoretic terminology: *entropy*, *polyalphabetic*, *frequency analysis*, *plaintext*, *ciphertext*, and *invariance*.
- **Synthesis / Evaluation (10%):** Evaluate the theoretical security of an encryption algorithm against brute-force vs. analytical attacks.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Invariance Under Transformation & Entropy Analysis
- **Level 1 (Concrete Anchor):** A Caesar shift cipher replacing letters with symbols, yet falling instantly to an analyst who counts how often the symbol for "E" appears.
- **Level 2 (Mechanistic Rule):** Human language has immutable, non-random statistical letter frequencies dictated by phonetic anatomy and grammar.
- **Level 3 (Governing System Law):** Conservation of Structural Invariance: Arbitrary surface-level transformations cannot obscure deep systemic patterns; unless entropy is completely randomized (One-Time Pad), underlying order inevitably leaks through.
- **Level 4 (Cross-Domain Transfer):** Applying frequency analysis to forensic accounting (detecting fraud via Benford's Law), behavioral profiling in intelligence analysis, and uncovering algorithmic bias.
- **Transfer Scenario:** A rogue trading desk attempts to conceal unauthorized transactions by altering account names, invoice codes, and transaction labels. How can a compliance auditor use frequency analysis and informational entropy (Al-Kindi's cryptanalysis method) to expose the fraudulent trading patterns without reading the altered labels?

Lesson 240 – The Sound of Green: Bioacoustics & Waveform Transduction

Syntactistics Diagnostic: SRI 12.3 (FK 10.2 · GF 13.8 · SMOG 12.9) | Words: 3,709 | Mastery Tests (mean): SRI 14.3 (FK 12.2) | Reading Load Delta: +2.0 SRI (Δ FK: +2.1) | Abs:Con Ratio: 1.06 (Mastery: 1.14) | Practice Test: FK 9.8 | Vector: CDI:20 · ABI:73 · SRS:69 · LDB:28 · PCV:62 · RFI:79

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Plant Physiology, Wave Physics & Acoustic Bio-Sensors
- **Core Physical Phenomenon:** Ultrasonic acoustic emissions from drought-stressed plant xylem cavitation, acoustic waveform physics, and piezoelectric sensor transduction.
- **Water Column Tension & Cohesion-Tension Theory:** The physical mechanics of sap ascent: solar transpiration pulling water through xylem vascular bundles under negative pressures exceeding $-2\text{ to }-5\text{ MPa}$.
- **Xylem Cavitation & Embolism:** The explosive rupture of water columns under extreme drought or freeze stress; nucleation of micro-bubbles forming an embolism that halts fluid transport.
- **Ultrasonic Cavitation Acoustic Signatures:** The physics of acoustic emissions: cavitation events generating microscopic ultrasonic shockwaves ranging from 20 kHz to over 150 kHz.
- **Piezoelectric Transduction:** Mechanical-to-electrical signal transduction: using piezoelectric ceramic contact sensors or specialized ultrasonic airborne microphones to convert acoustic pressure waves into millivolt electrical waveforms.
- **Frequency Spectrum & Envelope Analysis:** Fast Fourier Transform (FFT) analysis of acoustic clicks: pulse rise times, frequency centroids, decay duration, and acoustic distinction between cavitation clicks, wind noise, and insect damage.
- **Ecological Bio-Sensor Monitoring:** Using real-time plant acoustic emissions to automate high-precision agricultural irrigation networks, applying water only when cavitation frequencies cross critical physiological thresholds.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 11.3 | Lexile 1190L | Voice: Physical Bio-Engineering
- **Syntactic Focus:** Physical waveform descriptions; negative pressure mechanics; causal acoustic

emission syntax (*whereby tensile failure produces acoustic energy*).

- **Literal Comprehension (30%):** State the frequency range of plant cavitation clicks (20–150 kHz); describe the cohesion-tension mechanism of sap ascent.
- **Inferential Comprehension (45%):** Infer why drought stress causes xylem embolism; deduce how piezoelectric crystals convert mechanical pressure waves into measurable electrical voltage.
- **Vocabulary in Context (15%):** Define *cavitation*, *embolism*, *transduction*, *piezoelectric*, *attenuation*, and *ultrasonic*.
- **Synthesis / Evaluation (10%):** Analyze an acoustic emission frequency chart to differentiate between drought cavitation events and environmental background noise.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Transduction of Latent Sub-Threshold Stress
- **Level 1 (Concrete Anchor):** Drought-stressed tomato plants emitting ultrasonic acoustic clicks (20–100 kHz) as xylem water columns rupture, long before leaves show visible wilting.
- **Level 2 (Mechanistic Rule):** Inability of human sensory apparatus to perceive negative pressure cavitation directly; visual symptoms appear only after irreversible tissue damage.
- **Level 3 (Governing System Law):** Acoustic Transduction of Systemic Cavitation: Physical failure in complex continuous-flow systems generates high-frequency acoustic shockwaves that provide actionable warning signals before macroscopic system failure.
- **Level 4 (Cross-Domain Transfer):** Applying cavitation bioacoustics to predictive vibration monitoring in jet engines, structural bridge integrity sensors, and detecting employee burnout in high-stress organizations.
- **Transfer Scenario:** A high-reliability hospital intensive care unit wants to detect clinician burnout and medical error risk before catastrophic malpractice incidents occur. How can leadership implement the "acoustic cavitation transduction" model to monitor subtle systemic friction signals without relying on delayed self-reporting surveys?

Lesson 250 – The Golden Ratio in Nature: Phyllotaxis & Optimization

Syntactistics Diagnostic: SRI 10.5 (FK 8.5 · GF 11.8 · SMOG 11.2) | Words: 3,265 | Mastery Tests (mean): SRI 12.5 (FK 10.7) | Reading Load Delta: +2.0 SRI (Δ FK: +2.2) | Abs:Con Ratio: 1.34 (Mastery: 1.70) | Practice Test: FK 9.6 | Vector: CDI:37 · ABI:66 · SRS:59 · LDB:32 · PCV:44 · RFI:92

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Botanical Morphology, Irrational Mathematics & Geometric Optimization
- **Core Physical Phenomenon:** Spiral phyllotaxis, Fibonacci growth sequences, the golden ratio (Φ), and optimal spatial packing in biological organs.
- **The Fibonacci Sequence & Mathematical Derivation:** The recursive integer series ($1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89...$) where $F_n = F_{n-1} + F_{n-2}$; convergence of the ratio of consecutive terms toward the golden ratio: $\lim_{n \to \infty} \frac{F_n}{F_{n-1}} = \Phi \approx 1.6180339887...$
- **The Golden Angle in Botany:** Derivation of the golden angle: $360^\circ \times (1 - \frac{1}{\Phi}) \approx 137.5077...^\circ$; physical manifestation in plant shoot apical meristems.
- **Phyllotaxis of Composite Flowerheads:** Intersecting counter-rotating logarithmic spirals in sunflower seed heads (*Helianthus annuus*), pinecone bracts, and daisy disks, most often occurring in consecutive Fibonacci pairs (e.g., 34 clockwise and 55 counterclockwise).
- **Irrationality & Optimal Close-Packing:** Why rational fractions ($1/2, 2/3, 3/5$) cause newly forming seeds or leaves to line up in radial rows, leaving massive empty gaps, whereas an ideal golden-angle step never repeats a spoke; real plants approximate it to minimize overlapping.
- **Solar Exposure & Aerodynamic Efficiency:** Maximizing sunlight interception and rain runoff while minimizing self-shading across multi-tiered botanical foliage.
- **Biochemical Auxin Flux Dynamics:** Hofmeister's and Snow's rules of morphogenesis: auxin hormone depletion zones at the apical meristem preventing new leaf primordia from forming too close to existing ones, spontaneously generating golden angle spacing through biochemical repulsion.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 11.5 | Lexile 1200L | Voice: Mathematical Morphology

- **Syntactic Focus:** Recursive mathematical syntax (*where each term is the sum of the two preceding terms*); irrational geometric proof constructions.
- **Literal Comprehension (25%):** State the numerical value of the golden ratio ($\Phi \approx 1.618$) and the golden angle (137.5°); identify Fibonacci sequences in pinecones and sunflowers.
- **Inferential Comprehension (45%):** Infer why rational angular fractions result in inefficient clustering and radial spokes; explain how auxin hormone depletion zones spontaneously generate golden angle divergence.
- **Vocabulary in Context (15%):** Define *phyllotaxis*, *divergence angle*, *meristem*, *irrational number*, and *optimization*.
- **Synthesis / Evaluation (15%):** Evaluate biological morphology models to determine whether form is driven by genetic pre-programming or physical self-organization.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Irrational Packing & Optimal Dispersion
- **Level 1 (Concrete Anchor):** Sunflowers packing hundreds of seeds into a disk without gaps or overlapping rows by rotating each new seed by exactly 137.5° (Φ).
- **Level 2 (Mechanistic Rule):** Circular geometric boundaries; physical crowding; requirement that every seed receives equal sunlight, airflow, and spatial development.
- **Level 3 (Governing System Law):** Irrational Dispersion for Maximum Packing: In competitive spatial environments, alignment with rational fractions causes catastrophic crowding and empty dead zones; tuning close to irrational divergence ratios yields highly balanced, non-interfering dispersion.
- **Level 4 (Cross-Domain Transfer):** Applying golden angle phyllotaxis to satellite orbital slot allocations, wireless cellular frequency division multiplexing, and anti-clustering algorithms in autonomous vehicle navigation.
- **Transfer Scenario:** An urban drone delivery fleet is experiencing mid-air bottlenecking and signal interference because drones leave the distribution hub at standard clock intervals (every 1, 2, or 5 minutes). Using the irrational golden angle phyllotaxis model, how should the dispatch algorithm calculate departure intervals to eliminate clustering?

Division III: Structural Literacy, Symbolic Logic & Cybernetics

Lesson 300 – Architecture of the Book: Codicology & Quires

Syntactistics Diagnostic: SRI 10.6 (FK 8.5 · GF 11.7 · SMOG 11.5) | Words: 5,184 | Mastery Tests (mean): SRI 12.6 (FK 10.9) | Reading Load Delta: +2.0 SRI (Δ FK: +2.4) | Abs:Con Ratio: 1.09 (Mastery: 1.63) | Practice Test: FK 8.6 | Vector: CDI:40 · ABI:73 · SRS:59 · LDB:28 · PCV:50 · RFI:64

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Codicology, Material Culture & History of Information Architecture
- **Core Physical Phenomenon:** Folio folding, quire gathering, kettle-stitch binding, and the historical technological transition from the scroll to the random-access codex.
- **The Material Transition: Scroll to Codex:** Physical constraints of the papyrus/parchment rotulus (linear, sequential access, two-handed unwinding, single-sided writing) vs. the codex (recto/verso pagination, compact volume, bi-directional random access).
- **Sheet Folding & Folio Formats:** The physical geometry of book production:
- **Quire / Signature Gathering:** Nesting folded folios into uniform signatures (typically 4 sheets/16 pages or 8 sheets/32 pages) ready for sewing.
- **Tensile Binding & Structural Architecture:** Sewing signatures together along the spine folds using kettle stitches (*point de chaînette*) around raised cords or leather thongs; attachment of endpapers (pastedown and flyleaf) to serve as the mechanical hinge transferring mechanical stress between the paper text block and the protective exterior wooden/board case.
- **Script Imperial Standardization:** The development of Carolingian Minuscule under Alcuin of York (c. 780 AD) at the court of Charlemagne: introducing word spacing, clear ascenders/descenders, and lowercase legibility to unify administrative records across linguistic divides.
- **Scribal Intentionality & The Hebrew Sofer Protocol:** The Rabbinic material standards for the Torah scroll (*Sefer Torah*): feather quill selection, ink viscosity, oral vocalization of every word prior to inking, rendering the scroll unfit for liturgical use

until any touching or physically broken consonant is corrected.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 11.8 | Lexile 1220L | Voice: Historical Codicology & Material Hermeneutics
- **Syntactic Focus:** Archival descriptive syntax; high structural noun density; multi-tiered historical arguments.
- **Literal Comprehension (25%):** Contrast the scroll and the codex across random-access capabilities; define *signature*, *folio*, *pastedown*, and *flyleaf*.
- **Inferential Comprehension (40%):** Infer why Charlemagne commissioned the Carolingian Minuscule as an instrument of imperial administrative unification; explain the theological rationale behind the Hebrew scribal protocol of vocalizing words before inking.
- **Vocabulary in Context (15%):** Decode *codicology*, *quire*, *recto*, *verso*, *colophon*, and *minuscule*.
- **Synthesis / Evaluation (20%):** Synthesize material history to evaluate how physical information containers shape human cognitive processing across eras.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Modular Hierarchical Assembly & Random Access
- **Level 1 (Concrete Anchor):** Ancient scribes cutting scrolls into uniform sheets, folding them into quires, sewing the spines, and inventing the random-access codex.
- **Level 2 (Mechanistic Rule):** Physical fatigue and linear access delays of the continuous papyrus scroll; inability to cross-reference multiple texts rapidly.
- **Level 3 (Governing System Law):** Modular Hierarchical Containment: Transforming a continuous linear process into nested, modular sub-assemblies (pages $\to$ folios $\to$ quires $\to$ text block) unlocks non-linear random access and exponential durability.
- **Level 4 (Cross-Domain Transfer):** Applying codicological architecture to relational database indexing, modular software microservices, and constitutional balance of powers.
- **Transfer Scenario:** A large enterprise maintains a single, 500-page master operations manual that employees find impossible to navigate during emergencies. Using the codicological shift from scroll to quire-bound codex, how should the operations team restructure this information architecture to enable instantaneous random access and localized maintenance?

Lesson 310 – Words That Changed Shape: Semantic Drift & Phonology

Syntactistics Diagnostic: SRI 11.4 (FK 9.6 · GF 12.6 · SMOG 12.1) | Words: 4,977 | Mastery Tests (mean): SRI 12.3 (FK 10.6) | Reading Load Delta: +0.9 SRI (Δ FK: +1.0) | Abs:Con Ratio: 3.70 (Mastery: 3.78) | Practice Test: FK 9.2 | Vector: CDI:28 · ABI:7 · SRS:63 · LDB:29 · PCV:52 · RFI:94

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Diachronic Historical Linguistics, Phonetics & Historical Semantics
- **Core Physical Phenomenon:** Sound changes in human vocal anatomy, consonant mutations across languages, and predictable vectors of semantic word change over centuries.
- **Phonetic Vocal Tract Anatomy:** The physical mechanics of speech production: voiced vs. unvoiced consonants, points of articulation (bilabial, dental, velar), and manners of articulation (stops, fricatives, nasals).
- **Grimm's Law of Consonant Shift:** The systematic, predictable sound mutation that separated Germanic languages from other Indo-European branches:
- **The Five Primary Vectors of Semantic Drift:**
- **The Euphemism Treadmill (Pinker's Law):** The sociological process whereby newly coined polite or clinical terms inevitably absorb the negative connotations of the underlying taboo concept, necessitating continuous lexical replacement.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 12.2 | Lexile 1260L | Voice: Diachronic Linguistic Analysis
- **Syntactic Focus:** Historical etymological tracking; systematic phonetic transformation rules; high Cause-Density Index.
- **Literal Comprehension (20%):** Identify the five mechanisms of semantic drift (broadening, narrowing, pejoration, amelioration, metaphorical extension); state the sound shifts codified in Grimm's Law.

- **Inferential Comprehension (45%):** Infer why shared etymological roots do not prevent independent semantic drift across daughter languages; apply the euphemism treadmill to explain the rapid linguistic degradation of clinical terminology.
- **Vocabulary in Context (15%):** Interpret linguistic jargon: *diachronic*, *phonology*, *cognate*, *pejoration*, *amelioration*, and *fricative*.
- **Synthesis / Evaluation (20%):** Evaluate competing prescriptivist vs. descriptivist linguistic claims regarding modern language evolution.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Systematic Drift & Phonological Laws
- **Level 1 (Concrete Anchor):** Consonants systematically shifting across millennia (Latin *pater* becoming English *father*); words undergoing predictable pejoration (*silly* drifting from "blessed" to "foolish").
- **Level 2 (Mechanistic Rule):** Human vocal tract anatomical economy (ease of articulation); social status signaling driving euphemistic substitution.
- **Level 3 (Governing System Law):** Predictable Diachronic Mutation: Complex cultural and linguistic symbols do not mutate randomly; they follow deterministic vectors of least mechanical resistance and sociological degradation over time.
- **Level 4 (Cross-Domain Transfer):** Applying Grimm's Law and semantic drift to brand decay in consumer marketing, the erosion of legal statutes through judicial reinterpretation, and the drift of corporate mission statements.
- **Transfer Scenario:** A medical technology company creates an innovative, life-saving clinical diagnostic protocol, but over a ten-year period, doctors begin using the protocol's name as slang for bureaucratic paperwork delays. Using the five vectors of semantic drift and Pinker's euphemism treadmill, diagnose how this mutation occurred and design a strategy to restore its clinical authority.

Lesson 320 – The Indo-European Root Engine: PIE Roots & Morphology

Syntactistics Diagnostic: SRI 12.9 (FK 11.0 · GF 14.4 · SMOG 13.4) | Words: 4,313 | Mastery Tests (mean): SRI 12.5 (FK 10.8) | Reading Load Delta: -0.4 SRI (Δ FK: -0.2) | Abs:Con Ratio: 2.31 (Mastery: 2.30) | Practice Test: FK 9.2 | Vector: CDI:72 · ABI:42 · SRS:72 · LDB:31 · PCV:100 · RFI:80

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Comparative Historical Linguistics, Etymology & Generative Morphology
- **Core Physical Phenomenon:** Proto-Indo-European (PIE) reconstructed root phonology, prefix/suffix affixation, and the generative derivation of multi-language vocabularies.
- **Discovery of the Indo-European Language Family:** Sir William Jones's 1786 address demonstrating the structural, grammatical, and lexical cognates between Sanskrit, Greek, Latin, Gothic, Celtic, and Persian.
- **PIE Root Mechanics:** The monosyllabic consonantal root structure of Proto-Indo-European (typically $C-e-C$ shape) and vowel ablaut grading (e-grade, o-grade, zero-grade) generating verbs, nouns, and adjectives.
- **The Generative Root Engine (High-Yield Roots):**
- **Morphemic Word Anatomy:** Parsing complex polysyllabic vocabulary into functional segments: Prefix (spatial direction) + Root (core empirical action) + Suffix (grammatical part of speech).
- **Etymological Cognate Identification:** Systematic recognition of shared ancestry across modern English vocabulary pairs where one word entered via native Germanic survival and the other via Norman French or scholarly Latin borrowing (*cow/beef*, *brotherly/fraternal*, *two/dual*).

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 12.6 | Lexile 1300L | Voice: Comparative Philology & Generative Semantics
- **Syntactic Focus:** Morphemic decomposition syntax; multi-tier cross-linguistic derivations; abstract conceptual mapping.
- **Literal Comprehension (20%):** Identify reconstructed PIE roots (**bher-*,**sta-*,**gen-*,**spec-*); trace their modern English, Latin, and Greek descendants.
- **Inferential Comprehension (50%):** Apply root meanings to decode three unfamiliar polysyllabic

compound words simultaneously; infer the ancestral worldview embedded in conceptual root clusters.

- **Vocabulary in Context (15%):** Morphologically deconstruct complex academic vocabulary into prefix + root + suffix components in novel text passages.
- **Synthesis / Evaluation (15%):** Evaluate the generative power of morphemic root systems vs. rote memorization of discrete dictionary definitions.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Generative Conceptual Primitives & Tree Derivations
- **Level 1 (Concrete Anchor):** Dozens of modern English words (*transfer*, *fertile*, *suffer*, *bear*, *burden*, *metaphor*) all branching from a single ancestral root: **bher-*.
- **Level 2 (Mechanistic Rule):** Cognitive load: human working memory cannot store tens of thousands of unrelated words as isolated, atomic facts without catastrophic forgetting.
- **Level 3 (Governing System Law):** Generative Primitive Compression: Vast, complex conceptual domains can be compressed into a compact set of invariant functional primitives that generate infinite modular variations when combined with operational modifiers (affixes).
- **Level 4 (Cross-Domain Transfer):** Applying PIE root engines to object-oriented programming class hierarchies, chemical nomenclature systems, and the design of modular design systems in UI/UX architecture.
- **Transfer Scenario:** A software company is drowning in 4,000 distinct feature requests from enterprise clients, causing development paralysis. How can the lead product architect use the "Proto-Indo-European Root Engine" model to reduce those 4,000 requests to 4 generative architectural primitives that satisfy all downstream variations?

Lesson 325 – Logical Lorem Ipsum: Formal Propositional Calculus

Syntactistics Diagnostic: SRI 11.4 (FK 9.6 · GF 12.6 · SMOG 12.0) | Words: 10,967 | Mastery Tests (mean): SRI 12.8 (FK 11.1) | Reading Load Delta: +1.4 SRI (Δ FK: +1.5) | Abs:Con Ratio: 2.34 (Mastery: 2.38) | Practice Test: FK 10.4 | Vector: CDI:57 · ABI:42 · SRS:63 · LDB:21 · PCV:72 · RFI:87

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Formal Logic, Propositional Calculus & Syntactic Insulation
- **Core Physical Phenomenon:** Propositional truth operators, syllogistic structure, Cause-Density Index (CDI), and the decoupling of syntactic logic from semantic meaning.
- **Formal Propositional Operators:**
- **Classical Syllogistic Inference Rules:**
- **Formal Logical Fallacies:** Identifying structural breakdowns:
- **Syntax Insulation via Semantic Nullification:** Using nonsensical tokens ("Lorem ipsum", "corvids of zenth", "flurbils") within rigid syntactic frames to test pure logical deduction completely insulated from intuitive real-world bias.
- **The Cause-Density Index (CDI):** Calculating the ratio of causal connectives (*therefore, because, consequently, provided that, whence*) relative to total sentence clauses in high-density analytical text.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 13.2 | Lexile 1350L | Voice: Formal Analytic Logic
- **Syntactic Focus:** Pure propositional operators; syntax insulated from semantic content; symbolic deduction clauses.
- **Literal Comprehension (15%):** State truth tables for conjunction, disjunction, material conditional, and biconditional; identify definitions of *modus ponens* and *modus tollens*.
- **Inferential Comprehension (55%):** Execute deductive proofs using nonsense semantic tokens ("Lorem ipsum") to derive valid conclusions strictly from syntactic conjunctions, disjunctions, and implications; diagnose formal fallacies (affirming the consequent, denying the antecedent) embedded in prose.
- **Vocabulary in Context (10%):** Identify propositional operators and truth values in text independent of real-world knowledge.
- **Synthesis / Evaluation (20%):** Evaluate argument validity purely by translating natural language editorial rhetoric into formal propositional syntax.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Syntactic Logic Decoupled from Semantic Bias
- **Level 1 (Concrete Anchor):** Solving deductive syllogisms where real words are replaced with nonsensical tokens (*If all flurbils are zonks, and this is a flurbil...*).

- **Level 2 (Mechanistic Rule):** Human cognitive confirmation bias: when real-world words are used, humans evaluate arguments based on whether they agree with the conclusion rather than whether the structural logic is valid.
- **Level 3 (Governing System Law):** Syntactic Structural Validity: The truth-preserving validity of a deduction is entirely determined by its syntactic relational framework, completely independent of the empirical semantic content flowing through it.
- **Level 4 (Cross-Domain Transfer):** Applying syntax stripping to blind contract auditing, mathematical formal proofs, algorithmic verification in compilers, and jury instruction design in criminal trials.
- **Transfer Scenario:** A corporate board is bitterly divided over a proposed merger because strong emotional personalities and political alliances are clouding judgment. As an independent governance consultant, how can you use the "Logical Lorem Ipsum" syntax-stripping technique to force the board to evaluate the merger's formal logical soundness without mentioning personalities, companies, or brand names?

Lesson 330 – 4-7-8 and the Trojan Seme: Vagal Neurobiology & Semiotics

Syntactistics Diagnostic: SRI 10.2 (FK 8.3 · GF 11.2 · SMOG 11.1) | Words: 4,506 | Mastery Tests (mean): SRI 13.7 (FK 12.1) | Reading Load Delta: +3.5 SRI (Δ FK: +3.8) | Abs:Con Ratio: 2.10 (Mastery: 3.27) | Practice Test: FK 10.4 | Vector: CDI:37 · ABI:48 · SRS:56 · LDB:31 · PCV:57 · RFI:70

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Autonomic Neurobiology, Psychophysiology & Cultural Memetics
- **Core Physical Phenomenon:** Respiratory sinus arrhythmia, parasympathetic vagal nerve stimulation, and the packaging of viral ideological concepts ("trojan semes").
- **Autonomic Nervous System Architecture:** Antagonistic balance between the Sympathetic Nervous System (SNS: "fight, flight, freeze"; epinephrine, norepinephrine, accelerated heart rate) and Parasympathetic Nervous System (PNS: "rest, digest, social engagement"; acetylcholine, heart rate deceleration).
- **The Vagal Nerve & Respiratory Sinus Arrhythmia:** Anatomical trajectory of Cranial Nerve X (the Vagus); how prolonged exhalation increases thoracic pressure, activating baroreceptors that stimulate the vagus nerve to release acetylcholine onto the sinoatrial node, physically slowing heart rate.
- **The 4-7-8 Respiratory Protocol:**
- **Memetics & The "Trojan Seme" Anatomy:** Richard Dawkins' concept of the meme as an informational replicator; the anatomy of a ideological virus:
- **Cognitive Filter Bypass Mechanics:** How states of emotional agitation, exhaustion, or rapid social signaling lower cognitive defense thresholds, allowing Trojan payloads to integrate into long-term belief architecture without conscious scrutiny.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 13.8 | Lexile 1400L | Voice: Psychophysiology & Critical Cultural Theory
- **Syntactic Focus:** Neuro-anatomical causal chains; dual-track biological and memetic discourse; high subordinating clause density.
- **Literal Comprehension (20%):** State the mechanical counts and phases of the 4-7-8 breathing method; describe Cranial Nerve X (Vagus) innervations.
- **Inferential Comprehension (45%):** Infer the physiological feedback mechanism connecting thoracic pressure to sinoatrial pacing; explain how cultural memeplexes package unexamined assumptions (Trojan payloads) within highly attractive or physiological truths.
- **Vocabulary in Context (15%):** Decode *respiratory sinus arrhythmia*, *parasympathetic*, *acetylcholine*, *seme*, *memeplex*, and *semiotics*.
- **Synthesis / Evaluation (20%):** Synthesize neurobiology and semiotics to evaluate how physiological dysregulation increases human susceptibility to ideological propaganda.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Somatic Feedback Regulation & Cognitive Trojaning
- **Level 1 (Concrete Anchor):** Prolonging exhalation to 8 seconds physically decelerating heart rate via the vagus nerve; viral memes carrying unexamined ideological payloads into unsuspecting minds.
- **Level 2 (Mechanistic Rule):** Autonomic nervous system vulnerability to hyper-arousal; cognitive filter fatigue during states of physiological dysregulation.
- **Level 3 (Governing System Law):** Somatic-Cognitive Boundary Regulation: The human mind cannot exercise high-level critical scrutiny

when the somatic vehicle is in autonomic alarm; furthermore, external informational replicators exploit emotional dysregulation to bypass critical cognitive filters.

- **Level 4 (Cross-Domain Transfer):** Applying vagal braking and Trojan semes to cybersecurity social engineering defenses, high-stakes crisis negotiations, and media literacy in digital environments.
- **Transfer Scenario:** A critical infrastructure utility is suffering frequent social-engineering spear-phishing attacks because employees are rushed, stressed, and panicking when urgent emails arrive. Using the 4-7-8 somatic regulation and Trojan seme models, design an operational protocol that prevents employees from executing compromised links.

Lesson 340 – How to Have a Hard Conversation: DI-LOGOS & Mediation

Syntactistics Diagnostic: SRI 11.7 (FK 9.7 · GF 13.0 · SMOG 12.4) | Words: 3,866 | Mastery Tests (mean): SRI 13.9 (FK 12.1) | Reading Load Delta: +2.2 SRI (Δ FK: +2.5) | Abs:Con Ratio: 5.54 (Mastery: 4.08) | Practice Test: FK 11.0 | Vector: CDI:18 · ABI:0 · SRS:65 · LDB:29 · PCV:58 · RFI:92

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Pragmatics, Discourse Analysis, Dialectical Mediation & Conflict Resolution
- **Core Physical Phenomenon:** Interpersonal conflict escalation, physiological flooding thresholds, and formal dialectical de-escalation protocols.
- **Physiological Flooding in Conflict:** John Gottman's research on autonomic arousal during interpersonal confrontation: heart rate crossing 100 BPM, systemic adrenaline dump, loss of active listening capacity, and regression to defensive cognitive scripts.
- **The Four Communication Failure Modes:**
- **The DI-LOGOS Protocol Mechanics:**
- **Decoupling Identity from Proposition:** The linguistic discipline of separating an individual's personal worth and structural belonging from the empirical validity of their operational claims.
- **Boundary Demarcation & De-escalation Levers:** Knowing when to enact tactical conversation pauses (20-minute minimum physiological reset period) to allow neurochemical cortisol and adrenaline dissipation before resuming negotiation.

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 14.2 | Lexile 1440L | Voice: Discourse Pragmatics & Clinical Mediation
- **Syntactic Focus:** Dialectical analysis; subtle rhetorical distinction clauses; modal verbs of negotiation (*could, would, might, whereby*).
- **Literal Comprehension (20%):** Recall the physiological arousal thresholds (100 BPM) defining emotional flooding; state the three stages of the DI-LOGOS protocol.
- **Inferential Comprehension (45%):** Infer why defending one's intent inflames rather than de-escalates interpersonal defensiveness; deduce the conversational leverage point where fact separation prevents narrative runaway.
- **Vocabulary in Context (15%):** Interpret discourse terms: *physiological flooding*, *demarcation*, *affect*, *stonewalling*, *dialectic*, and *contempt*.
- **Synthesis / Evaluation (20%):** Evaluate transcribed conflict transcripts to identify conversational failure points and construct optimal de-escalation interventions.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Equilibrium Stabilization in Social Systems
- **Level 1 (Concrete Anchor):** Two business partners screaming at each other once heart rates exceed 100 BPM; resolving the deadlock using the DI-LOGOS protocol.
- **Level 2 (Mechanistic Rule):** Physiological flooding triggering amygdala hijacking; conflation of camera-recorded sensory facts with internal threat narratives.
- **Level 3 (Governing System Law):** Dialectical Boundary Demarcation: In high-friction relational systems, systemic stability is maintained only by strictly decoupling objective empirical observations from subjective affective interpretations and personal identity.
- **Level 4 (Cross-Domain Transfer):** Applying DI-LOGOS demarcation to international border arbitration, diplomatic peace treaties, code review debates between software engineering teams, and medical malpractice debriefs.
- **Transfer Scenario:** Two co-founders of an artificial intelligence startup are at each other's throats regarding equity dilution and company direction; both threaten to dissolve the company. Using the

DI-LOGOS demarcation protocol, outline the exact conversational staging necessary to de-escalate physiological flooding and decouple their personal identities from their strategic proposals.

Lesson 350 – The Algorithm Builder: State Machines & Cybernetics

Syntactistics Diagnostic: SRI 11.7 (FK 9.7 · GF 12.9 · SMOG 12.3) | Words: 5,273 | Mastery Tests (mean): SRI 15.1 (FK 13.4) | Reading Load Delta: +3.5 SRI (Δ FK: +3.7) | Abs:Con Ratio: 2.24 (Mastery: 3.05) | Practice Test: FK 11.7 | Vector: CDI:37 · ABI:44 · SRS:65 · LDB:29 · PCV:55 · RFI:85

I. Empirical Content Topics & Domain Concepts:

- **Empirical Domain:** Computer Science, Deterministic Automata & Cybernetic Control Systems
- **Core Physical Phenomenon:** Finite state machines, deterministic branching logic, sorting algorithms, and closed-loop control architectures.
- **Finite State Machine (FSM) Formal Architecture:** The mathematical definition of an automaton: a finite set of states (S), a finite set of input symbols (Σ), a transition function ($\delta: S \times \Sigma \to S$), an initial state ($s_0$), and a set of accept/terminal states (F).
- **Deterministic Branching & Conditionals:** Strict IF/THEN/ELSE conditional routing; mutual exclusivity and collective exhaustiveness in logical decision trees.
- **Sorting Algorithm Mechanics:**
- **Edge-Case Gating & Unhandled Exception Containment:** Identifying boundary inputs (null values, infinite loops, negative numbers, overflow values) and engineering explicit fail-safe fallback routines.
- **Cybernetic Feedback Loops:** Norbert Wiener's cybernetic control principles: Sensor (measuring actual output) $\to$ Comparator (measuring deviation from setpoint error) $\to$ Actuator (modulating input energy to restore system equilibrium).
- **Sousveillance vs. Surveillance Systems:** Structural differences in information asymmetry: centralized top-down monitoring (surveillance) vs. bottom-up, distributed, peer-level accountability and verification (sousveillance).

II. Reading Scaffolding & Tested ELA Objectives:

- **Target Readability Profile:** FK 15.0+ | Lexile 1480L+ | Voice: Formal Cybernetics & Computational Epistemology
- **Syntactic Focus:** Recursive logic syntax; algorithmic control flow (*while, until, if and only if, in the terminal state*); high abstract noun density.
- **Literal Comprehension (15%):** State the formal five-tuple definition of a finite state machine; define $O(n^2)$ vs. $O(n \log n)$ algorithmic complexity.
- **Inferential Comprehension (50%):** Trace state machine transition diagrams to predict output states under edge-case inputs; diagnose infinite loops and unhandled exceptions from algorithmic pseudocode descriptions.
- **Vocabulary in Context (15%):** Interpret formal computational nomenclature: *automaton*, *deterministic*, *edge-case*, *cybernetic*, *comparator*, and *sousveillance*.
- **Synthesis / Evaluation (20%):** Synthesize cybernetic control theory to evaluate the systemic failure modes of closed-loop algorithmic governance.

III. Cognitive Architecture & Abstraction Ladders:

- **Governing Systems Law (Lattice Node):** Deterministic Execution & Closed-Loop Cybernetic Control
- **Level 1 (Concrete Anchor):** Constructing a finite state machine that sorts arbitrary data arrays without crashing, regardless of corrupted or extreme edge-case inputs.
- **Level 2 (Mechanistic Rule):** Unhandled edge-case inputs triggering infinite loops or memory overflow; informational asymmetry between controller and environment.
- **Level 3 (Governing System Law):** Closed-Loop Cybernetic Containment: A deterministic system remains stable in volatile environments only if its transition functions account for all boundary edge cases and continuously modulate corrective actuation through sensor feedback.
- **Level 4 (Cross-Domain Transfer):** Applying cybernetic state machines to macroeconomic monetary policy, autonomous drone swarm guidance, and hospital patient triage protocols.
- **Transfer Scenario:** An autonomous municipal water management system repeatedly floods low-lying neighborhoods during sudden flash storms because its control logic relies on static, linear rules. Using finite state machine transitions, comparator feedback loops, and edge-case containment, redesign the control architecture to handle unexpected deluge conditions safely.