

Eight Grade Intermediate World History B: Our Modern World, 1400 to 1917

Course Overview

Continuing a survey of World History from prehistoric to modern times, K¹² online lessons and assessments complement the second volume of *The Human Odyssey*, a textbook series developed and published by K¹².

This course focuses on the story of the past from the fourteenth century to 1917 and the beginning of World War I. The course is organized chronologically and, within broad eras, regionally. Lessons explore developments in religion, philosophy, the arts, and science and technology. The course introduces geography concepts and skills as they appear in the context of the historical narrative. Major topics of study include:

- The cultural rebirth of Europe in the Renaissance
- The Reformation and Counter-Reformation
- The rise of Islamic empires
- Changing civilizations in China, Japan, and Russia
- The Age of Exploration, and the civilizations that had been flourishing in the Americas for hundreds of years prior to encounters with Europeans
- The changes that came with the Scientific Revolution and the Enlightenment
- Democratic revolutions of the eighteenth and nineteenth centuries
- The Industrial Revolution and its consequences
- Nineteenth century nationalism and imperialism
- The remarkable transformations in communications and society at the turn of the twentieth century

Course Outline

Beginning

History is the study of the human past—the story of change over time. It's a story based on evidence. Our physical world is the setting that helps shape the story, and real people are its heroes. Historians ask questions about all of these elements. Why did Europeans of the Middle Ages build cathedrals? How did the shoguns of Japan maintain their power? What inspired explorers to set sail across the seas? Join our odyssey through history. The questions are endless; the answers, amazing.

- Getting Started

A Renaissance Begins in Europe

Most Europeans lost touch with classical Greece and Rome in the centuries after the fall of the Roman empire. They lost touch with each other and with Asia when trade declined. But in Italy, there were constant reminders of what had been. People used stones from the Colosseum to build their homes. They walked beneath great aqueducts, and scholars still read classical works. When the plague subsided and trade picked up in the fourteenth century, Italian artists, scholars, and authors were ready to try out new ideas, and there were merchants who could afford to help them. We know this period of enormous achievement as the *Renaissance*.

- Europe Reborn: Discovering Greece and Rome
- Cities Spur Change
- Genius in Florence
- Rome Revived

The Spread of New Ideas

The Renaissance wasn't limited to Italy, and it wasn't limited to new styles of art and literature. Ideas spread north from Italy and artists and thinkers across Northern Europe used those ideas to create their own distinct styles. Renaissance ideas spread into other fields as well. Ideas that we take for granted today in politics and religion came about during the Renaissance. Machiavelli questioned the political world, while Luther and Calvin questioned the practices and beliefs of the Christian Church and the Church examined itself. Europe and the world would never be the same.

- The Renaissance Beyond Italy
- The Reformation Splits Christendom
- The Counter-Reformation and Beyond

New Powers in Asia

While European culture grew and redefined itself, political and cultural changes occurred in Asia, too. Almost every part of Asia had suffered hardship during Mongol rule. Now, each region developed its own political and cultural identity. Great Muslim empires rose in Western and Southern Asia, and the religious differences within Islam led to political conflict in some places. Farther east in China, the Ming dynasty achieved greatness and supported tremendous cultural accomplishment. In Japan, a feudal system maintained control. And in Russia, rulers borrowed cultural ideas that would become distinctly Russian.

- Three Islamic Empires
- Ming China and Feudal Japan
- Russia Rising

Europe Seeks Asia and Meets the Americas

Asia had much to offer and Europeans knew it. But how could they get the spices, silks, porcelain, and all the rest? The Ottomans controlled the ancient Silk Road, and it was terribly dangerous to travel through mountains and deserts anyway. But what if ships could sail to Asia and

back again? New ship design and new navigation aids might make such trips possible. The race was on. The explorers and those who sent them knew what they were after. They had no idea that they would actually find whole worlds unknown to them. At the same time, the people of the powerful empires across the seas knew nothing of Europe or Asia or Africa. They had no idea what was about to happen.

- Portugal and Spain Explore, and the Age of Exploration
- Filling in the Map
- Old Civilizations

Exploration Changes the World

Gold, glory, and God. The Spanish and Portuguese conquistadors and their sponsors knew what their goals were, and they were willing to go to great lengths to achieve them. Guns and germs helped them defeat two great empires. But the conquistadors could not have predicted the long-term and often unintended consequences of their actions. Farming changed on three continents. Diets changed. Thousands of people willingly crossed the oceans to start new lives. Millions were kidnapped and forced to cross the oceans as slaves. And millions more died of disease and abuse. We still feel the consequences today.

- Clash of Civilizations
- The Spanish and Portuguese Empires
- The Columbian Exchange
- Songhai, Benin, and the New Slave Trade

Changing Empires, Changing Ideas

Elizabeth I was quite a woman and quite a ruler. One of England's most powerful monarchs, she had an entire age named for her, and the explorations she sponsored led to the colonies that became the United States. But England faced difficult times after Elizabeth, and a political revolution there meant that no English monarch would ever again have so much power. At the same time, a revolution in science changed the way people think and started "modern times." Have you ever examined something to find out more about it? Or conducted a small experiment? Do you believe you can figure a lot of things out for yourself by using your mind? Then you are part of an enlightened age.

- Elizabethan England and North American Initiatives
- England: Civil War and Empire
- The Scientific Revolution
- The Enlightenment: An Age of Reason

Writing

The world changed in many ways between 1300 and 1800. Think of all that happened and all the people who influenced what happened. Which individual had the most influence on the way people thought, particularly in Europe? Could it have been Leonardo da Vinci? Or

Johannes Gutenberg? How about Martin Luther, or John Locke, or Isaac Newton? Prepare to choose someone who interests you as a topic for research and writing.

- Writing from Research

Age of Democratic Revolutions

England's revolution was just the beginning. Educated people in many places read and thought about what had happened in England and what John Locke had said about the purpose of government. They gathered in French salons to discuss politics as well as philosophy and art. And the more they thought about it, the more they grew dissatisfied with the status quo—the way things were. In British colonies like Virginia and Massachusetts, in France, in the Spanish colonies of Latin America, and even in Russia, the time had come for change. A revolution is just that—a dramatic change—and the world was about to witness a series of revolutions. How many would succeed? How difficult would they be?

- The World Turned Upside Down: The American Revolution
- The French Revolution
- Napoleon: From Revolution to Empire
- Latin American Independence Movements
- The Russia of the Romanovs

Revolutions in Arts, Industries, and Work

The eighteenth and nineteenth centuries saw remarkable political revolutions. But not all revolutions are about government. In the midst of the political changes taking place in the eighteenth and nineteenth centuries, there were revolutions taking place in arts and industries, in economics, and in communication and transportation, too. Everyday life may have changed more between 1750 and 2000 than in all the human history before that. Much of that change gave people longer lives and less labor. But some of it brought human misery and indescribable hardship—problems the world is still trying to solve.

- Romantic Art in an Age of Revolution
- Britain Begins the Industrial Revolution
- A Revolution in Transportation and Communication
- Hard Times
- Slavery in a Modern World

Picturing Your Thoughts

A picture is worth a thousand words. So what is a whole collage of pictures worth? When you put it together thoughtfully, a collage can speak volumes and even prove a point.

- Picturing Your Thoughts

Nations Unite and Expand

Can you name the nations of Europe? If you thought of Italy and Germany as two of them, you would be right. But that wasn't true 150 years ago. As old as their cultures and histories are, Italy and Germany are fairly

young as unified nations. The United States had to fight to be unified 150 years ago, too. But once those issues were settled, there was time for enormous innovation. A new industrial revolution occurred and it resulted in both astonishing inventions and a need for raw materials and markets. A new race started; this one for empire.

- Growing Nationalism in Italy and Germany
- The United States Fights and Unites
- Age of Innovation
- The New Imperialism

Answers and Questions

People of the nineteenth century were confident that they could change things for the better. So when cities grew too fast and workers lived there in filth, it was time to take action. Scientists worked on disease. City governments worked on sanitation. Industrial workers organized unions to gain better conditions, and women demanded a voice. Writers and artists looked for answers to serious questions, too, as did musicians. And entrepreneurs—business leaders with vision—saw the cities and the people in them in a whole new way.

- Organizing for Change
- Reaching Millions
- Culture Shocks
- Remarkable Individuals

The Dawn of the Twentieth Century

The world seemed to be getting smaller and smaller as the twentieth century opened. Canals made travel from one part of the world to another faster and safer. Soon, people would be traveling at unimaginable speeds through the air, as well. And ideas about who people are and what rights they have brought people together in their demands for self-rule. In Southeastern Europe, in Central Europe, in India, and in China and parts of Africa, people developed a sense of *nationalism*, identity with their own country. And they demanded the freedom to throw off the old empires and rule themselves.

- Rising Expectations in Waning Empires
- Linking the Seas and Reaching for the Skies
- Wrapping Up

Literary Analysis and Composition

Course Overview

Literary Analysis and Composition is a course designed for students at the end of the middle grades and the beginning of high school (grades 8-9). Throughout this

course, students will engage in literary analysis of short stories, poetry, drama, novels, and nonfiction. The course focuses on the interpretation of literary works and the development of oral and written communication skills in standard (formal) English. The program is organized in four strands: Literature, Composition; Grammar, Usage and Mechanics (GUM); and Vocabulary.

Course Outline

Literature

Designed to encourage the appreciation of classic literature, this strand exposes students to both canonical works and less familiar texts and offers a variety of literature to suit diverse tastes. Whether they are reading poetry, drama, autobiography, short stories, or novels, students will be guided through close readings so that they can analyze the formal features of literary texts. Lessons also provide rich background and information to encourage contextual exploration. In this literature program, students read “what’s between the lines” to interpret literature and they go beyond the book to discover how the culture in which a work of literature was created contributes to the themes and ideas it conveys. Students will consider how the struggles, subjects, and ideas they find within these works are relevant to everyday living.

Readings include:

- “A Cub Pilot” from *Life on the Mississippi* by Mark Twain
- Selections from “Barrio Boy” by Ernest Galarza
- “No Gumption” by Russell Baker
- Selections from *I Know Why the Caged Bird Sings* by Maya Angelou

Poetry: Stories in Verse

- “Lochinvar” by Sir Walter Scott
- “The Raven” by Edgar Allan Poe
- “Annabel Lee” by Edgar Allan Poe
- “The Song of the Wandering Aengus” by William Butler Yeats
- “The Wreck of the Hesperus” by Henry Wadsworth Longfellow
- “The Creation” by James Weldon Johnson

Short Stories

- “The Glass of Milk” by Manuel Rojas
- “To Build a Fire” by Jack London
- “The Secret Life of Walter Mitty” by James Thurber
- “The Piece of String” by Guy de Maupassant
- “The Tell-Tale Heart” by Edgar Allan Poe
- “The Lottery” by Shirley Jackson
- “The Lady or the Tiger” by Frank Stockton

Poetry: To Everything There Is a Season

- “Spring and Fall” by Gerard Manley Hopkins

- “In Just” by E.E. Cummings
- “July” by Susan H. Sweet
- “To Autumn” by John Keats
- “The Snowstorm” by Ralph Waldo Emerson
- “The Snow” by Emily Dickinson

The Bible as Literature

- Selections from Genesis: The Creation and the Fall; Cain and Abel
- Selected Psalms
- Parables: The Great Sheep, The Last Supper, The Prodigal Son
- Faith, Hope, and Charity

Poetry: Voices and Viewpoints

- “All” (Chinese poem) by Bei Dao
- “Also All” (an answer to “All”) by Shu Ting
- “Rainy Day” by Henry Wadsworth Longfellow
- “Invictus” by W. E. Henley
- “We Real Cool” by Gwendolyn Brooks
- “The Negro Speaks Rivers” by Langston Hughes
- “Mending Wall” by Robert Frost
- Sonnets 18 and 29 by William Shakespeare

Poetry of Ideas

- “I Dwell in Possibility” by Emily Dickinson
- “Will There Really Be a Morning” by Emily Dickinson
- “Ozymandias” by Percy Bysshe Shelley
- “Do Not Go Gentle Into That Good Night” by Dylan Thomas
- “The Charge of the Light Brigade” by Alfred Lord Tennyson
- “The Battle of Blenheim” by Robert Southey

Drama

- *Antigone* by Sophocles
- *Romeo and Juliet* by William Shakespeare

Autobiography (choose 1)

- *Anne Frank: The Diary of a Young Girl*
- *The Narrative of the Life of Frederick Douglass*

Novels (choose 2 during the year)

- *Animal Farm* by George Orwell
- *Jane Eyre* by Charlotte Bronte
- *Lord of the Flies* by William Golding
- *A Separate Peace* by John Knowles
- *A Tale of Two Cities* by Charles Dickens
- *To Kill a Mockingbird* by Harper Lee
- *The Yearling* by Marjorie Kinnan Rawlings

Partial List of Skills Taught:

- Describe characters based on speech, actions, or interactions with others

- Demonstrate knowledge of authors, characters, and events of historically or culturally significant works of literature.
- Identify character traits and motivations.
- Identify and interpret allusions.
- Identify conflict and resolution.
- Identify and explain the use of irony.
- Identify and interpret figurative language.
- Identify and interpret imagery.
- Identify and interpret sensory language.
- Identify cause and effect relationships.
- Identify climax.
- Identify elements of a drama.
- Identify elements of a short story.
- Identify theme.
- Identify point of view
- Make inferences and draw conclusions.
- Recognize the effect of setting or culture on a literary work.
- Recognize use of language to convey mood
- Recognize author's attitude or tone.
- Recognize author's purpose and devices used to accomplish it, including author's language, organization, and structure.
- Recognize how point of view affects literature

COMPOSITION

This strand builds on the skills introduced in Intermediate Composition Courses. In this writing program, students continue to practice writing essays in various genres and increasingly focus on model essays from noteworthy authors. Many units use the literature lessons as a springboard and thereby reinforce the connection between reading for meaning and writing to communicate one's own ideas. Students learn the form and structure of a variety of essays they will encounter in their academic careers including: memoirs (narrative), literary essays, compare and contrast essays, research papers, descriptive writing, and arguments. In writing each essay, students go through a process of planning, organizing, and revising, and they learn to examine their own writing with a critical eye, paying attention to ideas, organization, structure, style, and correctness. Throughout the course, students write in response to prompts similar to those they will encounter on standardized tests.

Memoir

- Analysis of a Memoir: Examining Mark Twain's "A Cub Pilot"
- Planning a Memoir
- Writing a Memoir I
- Writing an Memoir II
- Revising a Memoir
- Proofreading and Publishing a Memoir

Literary Essay: Character

- What Is Literary Essay About Character?
- Planning a Literary Essay About Character
- Focusing and Organizing a Literary Essay About Character
- Writing a Literary Essay About Character
- Revising a Literary Essay About Character
- Proofreading and Publishing a Literary Essay About Character

Argument

- What Is an Argument?
- Recognizing Logical Fallacies and Emotional Appeals
- Choosing a Topic and Gathering Information
- Planning and Organizing the Argument
- Writing an Argument
- Revising an Argument
- Proofreading and Publishing an Argument

Making Us See: Description

- Seeing with the Mind's Eye I: Analysis of Excerpt from Hamlin Garland's *Boy Life on the Prairie*
- Seeing with the Mind's Eye II: Analysis of Excerpt from Henry David Thoreau's *Walden*
- Seeing with the Mind's Eye III: Analysis of an Excerpt from Annie Dillard's *Pilgrim at Tinker Creek*
- Recognizing Descriptive Language
- Planning a Descriptive Essay
- Writing a Descriptive Essay
- Polishing a Descriptive Essay

Research Paper

- What Is a Research Paper?
- Taking Notes I
- Taking Notes II
- Organizing the Information
- Writing a Research Paper I
- Writing a Research Paper II
- Creating a Works Cited Page
- Revising a Research Paper
- Proofreading and Publishing a Research Paper
- Revising
- Bibliography
- Proofreading
- Publishing

Literary Essay: Theme

- What Is a Literary Essay About Theme?
- Planning a Literary Essay About Theme
- Writing a Literary Essay About Theme
- Revising a Literary Essay About Theme
- Proofreading and Publishing a Literary Essay About Theme

Literary Essay: Compare and Contrast

- What Is a Compare and Contrast Essay About Literature?
- Planning a Compare and Contrast Essay About Literature
- Organizing a Compare and Contrast Essay About Literature
- Writing a Compare and Contrast Essay About Literature
- Polishing a Compare and Contrast Essay About Literature

Great Speeches and Oratory

- Reading, Listening to, and Analyzing a Speech I: The Gettysburg Address
- Reading, Listening to, and Analyzing a Speech I: I Have a Dream
- Planning a Speech
- Writing a Speech
- Revising a Speech
- Practicing and Delivering a Speech

GRAMMAR, USAGE, AND MECHANICS

How can a modifier be misplaced or dangling? Is there a positive to appositives? What's a gerund? The Grammar, Usage, and Mechanics (GUM) course addresses these and many other topics, with reinforcement activities in sentence analysis, sentence structure, and proper punctuation. Students analyze syntax and diagram sentences in order to understand how words, phrases, and clauses function in relation to each other. Skills updates, frequent exercises, cumulative reviews, and regular practice help students absorb the rules so they can confidently apply them in their own writing. *The Barrett Kendall Language Handbook* provides exercises and a ready resource for grammar rules and conventions.

Sentences, Fragments, and Run-Ons

- Sentences
- Fragments
- Run-Ons

Complements

- Direct Objects and Indirect Objects
- Predicate Nominatives and Predicate Adjectives

Phrases

- Prepositional Phrases
- Misplaced Modifiers and Appositives

Verbals and Verbal Phrases

- Participles and Participial Phrases
- Gerund
- Gerund Phrases
- Infinitives and Infinitive Phrases
- Misplaced and Dangling Modifiers

Clauses

- Independent and Subordinate Clauses

- Adverb Clauses
- Adjective Clauses
- Functions of Relative Pronouns
- Noun Clauses
- Sentence Structure

Using Verbs

- Principal Parts of Verbs
- Verb Tense
- Shift in Tense
- Active and Passive Voice

Using Pronouns

- Pronoun Case
- Pronoun Problems
- Pronouns in Comparison
- Indefinite Pronoun Antecedents and Antecedent Problems

Subject and Verb Agreement

- Agreement of Subjects and Verbs
- Common Agreement Problems
- Other Agreement Problems

Using Adjectives and Adverbs

- Comparison of Adjectives and Adverbs

Capital Letters

- Capitalization
- More Capitalization

End Marks and Commas

- End Marks
- Commas That Separate
- Comma That Enclose
- More Commas That Enclose

Italics and Quotation Marks

- Uses of Italics and Quotation Marks
- Direct Quotations
- Other Uses of Quotation Marks

Other Punctuation

- Apostrophes
- Semicolons
- Colons and Hyphens
- Dashes and Parentheses

VOCABULARY

Are you implacable or placid? Are you apathetic or empathic?

Though these pairs of words are nearly opposite in their meanings, they are closely related and easily defined by students who know the Latin root,—“*pacere*”—(to please) and the Greek root *pathos* (suffering). K₁₂'s Vocabulary

program uses the Vocabulary from Classical Roots program (from Educator's Publishing Service) to build knowledge of Greek and Latin words that form the roots of many English words. The purpose of the program is to help students unlock the meanings of words from classical roots, not necessarily to memorize lists of difficult or obscure vocabulary words. These polysyllabic words are those that frequently cause students to stumble and often appear on standardized tests. Throughout this program, students will define and use words with Greek and Latin roots, and use word origins and derivations to determine the meaning of new words, as they increase their own vocabularies and develop valuable test-taking skills.

The Person

- Latin roots *humanas, homo, vir, ego, genos, genus, generis*
- Greek roots *anthropos; gyne, femina, autos, gens, gentis*

Personal Relationships

- Latin roots *matrix, pater, frater, avunculus, familia, uxor, puer, morior, nascor*
- Greek roots *pais, sum, esse, fui, futurum, thanatos*

Feelings

- Latin roots *amo, amicus, odium, pax, cupio, placere, placare*
- Greek roots *philos, phileo, phobos, pathos, miso, dys*

Creature Comforts

- Latin roots *domus, dominus, dormio, somnus, lavare, vestis, coquere, vorare, melis, sal, bibere, potare, ludere*

The Head

- Latin roots *caput, cerebrum, facies, frons, oris, oratum, dens, gurges*
- Greek roots *odon*

The Body

- Latin roots *caro, collum, corpus, cor, os, dorsum, nervus, sanguis, sedeo*
- Greek roots *derm, gaster*

The Hands

- Latin roots *manus, dextra, digitus, flecto, rapio, plico, prehendo, pes, gradior, ambulo, calcitro, sto, stio, sisto*
- Greek root *podos*

Introduction to Algebra

Course Overview

Algebra I is a one-year course intended for students in grades 8 and 9. The course takes students through developing the tools and concepts that are central to the powerful abstraction and generalization that are made possible with algebra.

- Variables
- Grouping Symbols
- Introduction to Sets
- Equations
- Translating Words into Symbols
- Translating Sentences into Equations
- Translating Problems into Equations
- A Problem-Solving Plan
- Number Lines
- Opposites and Absolute Value

Working with Real Numbers

There are many different kinds of numbers. Negative numbers, positive numbers, integers, fractions, and decimals are just a few of the many groups of numbers. What do these varieties of numbers have in common? They all obey the rules of arithmetic. They can be added, subtracted, multiplied, and divided.

- Basic Assumptions
- Addition on a Number Line
- Rules for Addition
- Subtracting Real Numbers
- The Distributive Property
- Rules for Multiplication
- Problem Solving: Consecutive Integers
- The Reciprocal of a Real Number
- Dividing Real Numbers

Solving Equations and Problems, Part 1

A family tree shows you how people in your family are related to each other. A map can show you how various cities are related to each other. An equation describes how various quantities are related to each other. Once you have an equation, you may find a solution that will help you solve a real-world problem.

- Transforming Equations: Addition and Subtraction, Part 1
- Transforming Equations: Addition and Subtraction, Part 2
- Transforming Equations: Multiplication and Division, Part 1
- Transforming Equations: Multiplication and Division, Part 2
- Using Several Transformations, Part 1
- Using Several Transformations, Part 2

Solving Equations and Problems, Part 2

The Greek mathematician Diophantus is often called “the father of algebra.” His book *Arithmetica* described the solutions to 130 problems. He did not discover all of these solutions himself, but he did collect many solutions that had

been found by Greeks, Egyptians, and Babylonians before him. Some people of long ago obviously enjoyed doing algebra. It also helped them—and can help you—solve many real-world problems.

- Using Equations to Solve Problems, Part 1
- Using Equations to Solve Problems, Part 2
- Equations with the Variable on Both Sides
- Problem Solving: Using Charts
- Cost, Income, and Value Problems
- Proof in Algebra
- Inductive and Deductive Reasoning
- Reasoning: Counterexamples

Polynomials

Just as a train is built from linking railcars together, a polynomial is built by bringing terms together and linking them with plus or minus signs. You can perform basic operations on polynomials in the same way that you add, subtract, multiply, and divide numbers.

- Exponents
- Adding and Subtracting Polynomials, Part 1
- Adding and Subtracting Polynomials, Part 2
- Multiplying Monomials
- Powers of Monomials
- Multiplying Polynomials by Monomials
- Multiplying Polynomials
- Transforming Formulas
- Rate-Time-Distance Problems, Part 1
- Rate-Time-Distance Problems, Part 2
- Area Problems
- Problems Without Solutions

Factoring Polynomials, Part 1

A *polynomial* is an expression that has variables that represent numbers. A number can be factored, so you should be able to factor a polynomial, right? Sometimes you can and sometimes you can't. Finding ways to write a polynomial as a product of factors can be quite useful.

- Factoring Integers
- Dividing Monomials
- Monomial Factors of Polynomials
- Multiplying Binomials Mentally
- Differences of Two Squares
- Squares of Binomials

Factoring Polynomials, Part 2

When can a trinomial be factored? Why would anyone want to factor one in the first place? Once you get the hang of factoring polynomials, you can use factoring to help you solve many problems.

- Factoring Patterns, Part 1
- Factoring Patterns, Part 2
- Factoring Patterns, Part 3
- Factoring by Grouping
- Using Several Methods of Factoring

- Solving Equations by Factoring
- Using Factoring to Solve Problems

Fractions

A fraction always has a number in the numerator and in the denominator. However, those numbers can actually be expressions that represent numbers, which means you can do all sorts of interesting things with fractions. Fractions with variable expressions in the numerator and denominator can help you solve many kinds of problems.

- Simplifying Fractions
- Multiplying Fractions
- Dividing Fractions
- Least Common Denominators
- Adding and Subtracting Fractions
- Mixed Expressions
- Polynomial Long Division
- Hypothesis and Conclusion
- Sometimes, Always, and Never

Applying Fractions, Part 1

What do a scale drawing, a bicycle's gears, and a sale at the local store all have in common? They all present problems that can be solved using equations with fractions.

- Ratios, Part 1
- Ratios, Part 2
- Proportions, Part 1
- Proportions, Part 2
- Equations with Fractional Coefficients
- Dimensional Analysis
- Fractional Equations, Part 1
- Fractional Equations, Part 2

Applying Fractions, Part 2

Math is a useful tool for all kinds of scientists. Scientists must be precise in measuring things. With exponents, you can describe a very small distance, such as the width of a hair. With exponents, you can also describe very large distances, such as the distance between two planets.

- Percents, Part 1
- Percents, Part 2
- Percent Problems
- Mixture Problems
- Work Problems
- Negative Exponents
- Scientific Notation

Introduction to Functions, Part 1

A solar cell is a little machine that takes in solar energy and puts out electricity. A mathematical function is a machine that takes in a number as an input and produces another number as an output.

- Equations in Two Variables
- Points, Lines, and Their Graphs
- Slope of a Line

- The Slope-Intercept Form of a Linear Equation
- Parallel and Perpendicular Lines
- Determining an Equation of a Line
- The Point-Slope Form of a Linear Equation

Introduction to Functions, Part 2

There are many kinds of functions. Some have graphs that look like lines, while others have graphs that are curvy like a parabola. Functions can take other forms as well. Not every function has a graph that looks like a line or a parabola or even has an equation. The important thing to remember is that if you put any valid input into a function, you will get a single result out of it.

- Functions Defined by Tables and Graphs
- Functions Defined by Equations, Part 1
- Functions Defined by Equations, Part 2
- Linear and Quadratic Functions
- Relations: Domain and Range
- Direct Variation, Part 1
- Direct Variation, Part 2
- Inverse Variation

Systems of Linear Equations

When two people meet, they often shake hands or say “hello” to each other. Once they start talking to each other, they can find out what they have in common. What happens when two lines meet? Do they say anything? Probably not, but whenever two lines meet, you know they have at least one point in common. Finding the point at which they meet can help you solve problems in the real world.

- The Graphing Method
- The Substitution Method
- Solving Problems with Two Variables
- The Addition-or-Subtraction Method, Part 1
- The Addition-or-Subtraction Method, Part 2
- Multiplication with the Addition-or-Subtraction Method
- Wind and Current Problems, Part 1
- Wind and Current Problems, Part 2
- Puzzle Problems, Part 1
- Puzzle Problems, Part 2

Inequalities

Every mathematician knows that 5 is less than 7, but when is $y < x$? An inequality symbol can be used to describe how one number compares to another. It can also indicate a relationship between values.

- Order of Real Numbers
- Solving Inequalities
- Solving Problems Involving Inequalities
- Sets: Union and Intersection
- Solving Combined Inequalities
- Absolute Value in Open Sentences
- Absolute Values of Products in Open Sentences
- Graphing Linear Inequalities
- Systems of Linear Inequalities

Rational and Irrational Numbers

Are rational numbers very levelheaded? Are irrational numbers hard to reason with? Not really, but rational and irrational numbers have things in common and things that make them different.

- Properties of Rational Numbers
- Decimal Forms of Rational Numbers
- Rational Square Roots
- Irrational Square Roots
- Square Roots of Variable Expressions
- The Pythagorean Theorem
- Multiplying, Dividing, and Simplifying Radicals
- Adding and Subtracting Radicals
- Indirect Reasoning

Quadratic Functions

Solving equations can help you find answers to many kinds of problems in your daily life. Linear equations usually have one solution, but what about quadratic equations? How can you solve them and what do the solutions look like?

- Quadratic Equations with Perfect Squares
- Completing the Square
- The Quadratic Formula
- Graphs of Quadratic Equations: The Discriminant
- Methods of Solution
- Solving Problems Involving Quadratic Equations

Probability and Statistics

Statistics is the study of collecting, analyzing, interpreting, and presenting data. Since data are everywhere, statistics is a very important field of mathematics. Similarly, probability is the study of how likely events are. Statistics can help you understand probability and probability can help you understand data.

- Sample Spaces and Events
- Probability, Part 1
- Probability, Part 2
- Calculating Statistics
- Frequency Distributions
- Statistical Graphs
- Sampling, Part 1
- Sampling, Part 2

Geometry

Since Geometry is all about special figures and relationships, many people think that Algebra has little to do with it. This couldn't be further from the truth. Algebra and Geometry are topics that are intertwined since the language of Algebra can describe geometrical relationships and geometrical objects can illustrate algebraic relationships.

- Points, Lines, and Angles
- Pairs of Angles

- Triangles, Part 1
 - Triangles, Part 2
 - Similar Triangles
 - Area
 - Volume
 - Scale
-

Physical Science

Course Overview

K₁₂'s Middle School Physical Science course presents the fundamentals of physics and chemistry. Students explore the amazing universe we live in, including motion, energy, the nature of matter and atoms, how chemicals mix and react, and the forces that hold the universe together. The course begins with a study of chemistry. After discussing physical and measurement systems, students then explore the properties and characteristics of matter, changes in matter, and the structure of the atom. In addition they examine the Periodic Table, different types of compounds, chemical formulas, and chemical reactions. After becoming familiar with chemistry, students begin a study of physics, starting with motion and forces. Newton's laws of motion are studied and applied to motion, acceleration, periodic motion, and gravity. Next, students examine motion and work, which includes the study of potential and kinetic energy, heat, momentum, collisions, and simple machines. Students continue their studies investigating waves, light, electricity, and magnetism. They finish the year by completing a research project.

Course Outline

Introduction to Physical Science

What does physical science cover? Everything physical, which covers quite a lot. Begin your journey into physical science by learning about measurements and how to do proper lab procedures. You will also be introduced to lessons that will prepare you for standardized tests in science.

- Introduction to Physical Science
- Physical Systems
- Measurement and the International System
- Laboratory: Measured Steps
- Laboratory: Density
- Working with Model Problems
- Model Problems

Matter

Have you ever played solitaire, where you arrange cards horizontally and vertically looking for connections? Russian scientist Dmitri Mendeleev did, and he was

inspired to create the pattern of the Periodic Table. This pattern displayed in the periodic table helps us understand atoms, chemical reactions, chemical formulas, chemical compounds, atomic mass, and other concepts covered in this unit.

- Atoms
- Atomic and Mass Numbers
- Elements and the Periodic Table
- Design of the Periodic Table
- Molecules
- Properties of Matter
- States of Matter
- Physical and Chemical Changes

Chemistry

When you see the word *chemistry*, you may have an image of someone in a lab wearing goggles pouring liquids from one beaker to another. But chemistry surrounds you every day. Cars are built with chemicals and run on chemical fuel. Chemicals make up the clothes you wear and the food you eat. You breathe chemicals, your computer and radio are composed of chemicals, and our world today is dependent on chemicals.

- Chemical Bonding
- Chemical Reactions
- Chemical Formulas
- Laboratory: Testing and Producing Gases
- Rates of Chemical Reactions
- Chemical Equations
- Laboratory: Dissolving Metals
- Mixtures
- Separating Mixtures
- Solutions
- Substances
- Laboratory: Separating Ingredients
- Acids and Bases
- Model Problems

Force and Motion

When you roll a marble across a room, you open the door to understanding the same rules of motion that keep airplanes flying and pendulums swinging. What are these forces? What are the “laws” of motion? Come learn about displacement, speed, acceleration, Newton’s laws of motion, and gravitation.

- Force
- Gravitational Force
- Motion
- Laboratory: Calculating Speed
- Speed and Velocity
- Measuring Speed and Velocity
- Acceleration
- Newton’s First Law of Motion
- Mass and Weight
- Newton’s Second Law of Motion

- Newton's Third Law of Motion
- Buoyant Forces
- Laboratory: Precious Cargo
- Model Problems

Energy

Nothing stays the same, at least not in our universe. Energy is constantly changing from one form to another, whether it's the light in your house or the sound of a horn. The good thing is you can use this changing energy to do all sorts of work. Scientists can use mass to create energy, use explosions for transportation, and use electricity to make our work easier. Learn about the different energy that constantly surrounds you, and how you use this energy in your everyday life.

- Energy
- Work
- Kinetic Energy
- Potential Energy
- Laboratory: The Pendulum
- Laboratory: Using a Lever
- Simple Machines
- Compound Machines
- Laboratory: Heat Flow
- Thermal Energy
- Temperature
- Model Problems

Waves, Sound, and Light

At this very moment, you have a lot of waves traveling to your body. You have sound waves you can hear and light waves you can see, but there's even more that you cannot see. There are radio waves, radiation, magnetism, and other invisible waves that you use to cook with, navigate by, and communicate. Explore the different waves you're being exposed to every second of every day.

- Waves
- Electromagnetic Waves
- Light Waves
- Laboratory: Path of Light
- Reflection and Refraction
- Lenses
- Model Problems

Electricity and Magnetism

You've investigated forces, learned about energy, and examined waves; now look at electricity and magnetism, two particular forms of energy that are quite important to you. Yes, electricity keeps your computer on and your mp3 player going. But do you know why electricity is so useful? Do you wonder how to build your own circuits and currents? Do you know how to build a basic motor?

- Electric Charge
- Electric Currents
- Electric Circuits

- Laboratory: Series and Electric Circuits
- Magnetism
- Electricity and Magnetism
- Laboratory: Motoring On!
- Motors and Generators
- Model Problems

Scientific Investigation

Scientists conduct experiments and form conclusions. Now you can do the same thing. Be a scientist as you design and carry out your own experiment. Discover how the scientific process works, what makes it different from just guessing, and why it's the most powerful and successful way of figuring out how the forces of nature work.

- Scientific Methods
- Design and Set-Up Your Experiment
- Data Collection
- Data Analysis
- Reporting Conclusions
- Create a Display
- Oral Presentation

Lesson Time and Scheduling

Total lessons: 96 lessons in ten units of study; 7 laboratory lessons

Lesson time: 60 minutes per reading lesson; 90 minutes per lab. You might choose to split the lessons into smaller segments and take breaks as needed. The K¹² online lesson tracking system allows you to pick up wherever you left off in any given lesson.