



Intermediate Algebra

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Source	Author(s) (Text or Video)	Title(s)	Link (where applicable)
Flatworld	John Redden	Intermediate Algebra	Intermediate Algebra: FlatWorld
Mathispower4u	James Sousa	MathIsPower4U	Mathispower4u Videos

Knewton Intermediate Algebra was developed to meet the scope and sequence of a typical one semester algebra course . To develop the course, Knewton used three main sources of content: Flatworld, videos created by a Math Professor we have partnered with, and a team of Subject Matter Experts. The SMEs come from diverse backgrounds and are all academics in the field of Mathematics.

Knewton Elementary Algebra has two instructional sequences for every learning objective, giving students multiple opportunities to learn new concepts. Between our Flatworld, Video, and Knewton SMEs, we were able to solicit ideas from math instructors and students at all levels of higher education. Knewton Intermediate Algebra covers the typical breadth of algebra topics and also provides the necessary depth to ensure the course is manageable and engaging for instructors and students alike.



Intermediate Algebra I Table of Contents

Chapter 1: Algebra Review

Real Numbers and Properties

- Properties of Real Numbers and Order of Operations
 - Distinguish between natural numbers, whole numbers, and integers
 - Distinguish between rational and irrational numbers
 - Perform calculations using order of operations
 - Use the following properties of real numbers: inverse and identity
 - Use the following properties of real numbers: commutative, associative, and distributive
- Evaluate and Simplify Algebraic Expressions
 - Evaluate algebraic expressions with a single variable
 - Evaluate algebraic expressions with two variables
 - Identify constants and variables
 - Use a formula
 - Simplify algebraic expressions

Exponents and Scientific Notation

- Properties of Exponents
 - Understand exponent notation
 - Use the product rule of exponents
 - Use the quotient rule of exponents
 - Use the power rule of exponents
- Advanced Properties of Exponents
 - Use the negative and zero exponent rule
 - Find the power of a product
 - Find the power of a quotient
 - Simplify exponential expressions
- Scientific Notation
 - Convert between standard and scientific notation
 - Multiply and divide numbers in scientific notation

Polynomials

- Properties of Polynomials
 - Identify the degree and leading coefficient of a polynomial
 - Identify monomials, binomials, and trinomials
 - Operations on Polynomials
 - Add and subtract polynomials
 - Multiply binomials together
 - Multiply polynomials together
 - Perform operations with polynomials of several variables
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Linear Equations

- Solve Linear Equations in One Variable
 - Identify identity, conditional, and inconsistent equations
 - Solve equations in one variable algebraically, variable just on one side
 - Solve equations in one variable algebraically, variable on both sides
- Solve Linear Equations with Fractions and Decimals
 - Solve equations involving fractions
 - Solve equations involving decimals

Linear Inequalities

- Interval Notation and Simple Inequalities
 - Use interval notation
 - Use properties of inequalities
 - Solve simple inequalities in one variable algebraically
- Compound Inequalities
 - Solve compound inequalities in one variable algebraically

Chapter 2: Graphing Functions and Inequalities

Plotting Points and Lines

- Cartesian Coordinates and Distances
 - Use the distance formula, given two points
 - Plot ordered pairs in a Cartesian coordinate system
 - Use the midpoint formula
 - Graph equations by plotting points
- Identify Slopes and Intercepts
 - Find x-intercepts and y-intercepts
 - Find the slope of a line given two points
 - Understand the relationship between the slope and y-intercept of a line and its equation
- Find Linear Equations
 - Find equation, in slope-intercept form, of a line passing through two given points
 - Find equation of a line, in slope-intercept form, given slope and one point (point-slope formula)
 - Given slope and intercept, find the equation of a line and write it in standard form
 - Find the equation of vertical and horizontal lines

Relations and Functions

- The Definition of a Function
 - Representing relations on a Cartesian coordinate plane
 - Determine the domain and range from a graph
 - Determine if a relation is a function given ordered pairs
 - Determine if a relation is a function given a graph
-



- Function Notation
 - Use function notation with a numerical argument
 - Use function notation with an algebraic argument
 - Evaluate a function from a graph
 - Find the input from the output in function notation

Linear Functions and Their Graphs

- Graphs of Linear Functions
 - Identify and graph linear functions
 - Determine a linear function given a graph
- Horizontal and Vertical Lines and Graphical Interpretations of Equations and Inequalities
 - Understand properties of horizontal and vertical lines
 - Represent linear equations and inequalities graphically

Modeling Linear Functions

- Equations of Lines
 - Determine a linear function using point-slope form
 - Find a function that passes through a point and is parallel to another function
 - Find a function that passes through a point and is perpendicular to another function
- Modeling Linear Applications
 - Write a linear mathematical model
 - Use a linear model for interpolation and extrapolation
 - Use functions to represent revenue, cost and profit

Graphing the Basic Functions

- Piecewise Functions and Graphs of Basic Functions
 - Define and graph seven basic functions
 - Graph piecewise-defined functions
 - Evaluate piecewise-defined functions

Using Transformations to Graph Functions

- Transformations of Functions
 - Graph functions using vertical and horizontal translations
 - Graph functions using reflections about the x - and y - axes
 - Graph functions using dilations

Solving Absolute Value Equations and Inequalities

- Absolute Value Equations
 - Understand the concept of absolute value
 - Solve absolute value equations with one absolute value expression
 - Solve absolute value equations with two absolute value expressions
- Absolute Value Inequalities
 - Solve absolute value inequalities involving less than
 - Solve absolute value inequalities involving greater than

Solving Inequalities with Two Variables

- Solve Linear Inequalities
 - Determine if an ordered pair is in a solution set of a linear inequality with two variables
 - Graph the solution set of a linear inequality with two variables
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- Solve Nonlinear Inequalities
 - Determine if an ordered pair is in a solution set of a non-linear inequality with two variables
 - Graph the solution set of a non-linear inequality with two variables

Chapter 3: Solving Linear Systems

Linear Systems with Two Variables

- Graphing Linear Systems of Equations with Two Variables
 - Determine if an ordered pair is a solution to a system of linear equations
 - Solve systems of linear equations in two variables by graphing
 - Identify inconsistent and dependent systems of linear equations graphically, and express the solution of dependent equations
- Solving Linear Systems with Two Variables
 - Solve systems of linear equations in two variables by substitution
 - Solve systems of linear equations in two variables by elimination
 - Choose a method to solve a system of linear equations
- Applications of Linear Systems with Two Variables
 - Write and solve a system of linear equations in two variables in word problems
 - Write and solve mixture problems
 - Write and solve distance problems

Linear Systems with Three Variables

- Solving Linear Systems with Three Variables
 - Check solutions to linear systems with three variables
 - Solve linear systems with three variables by elimination
 - Identify dependent and inconsistent linear systems with three variables
 - Solve applications involving three unknowns

Solving Linear Systems with Matrices

- Matrices and Gaussian Elimination
 - Use back substitution to solve linear systems in upper triangular form
 - Convert linear systems to equivalent augmented matrices
 - Solve a linear system of equations with two variables using Gaussian elimination
 - Solve a linear system of equations with three variables using Gaussian elimination
- Determinants and Cramer's Rule
 - Calculate the determinant of a 2×2 matrix
 - Calculate the determinant of a 3×3 matrix
 - Use Cramer's rule to solve systems of linear equations with two variables
 - Use Cramer's rule to solve systems of linear equations with three variables

Systems of Inequalities with Two Variables

- Solving Linear Systems of Inequalities
 - Determine if an ordered pair is a solution to a system of linear inequalities with two variables
 - Graph the solution sets of systems of linear inequalities
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- Solving Nonlinear Systems of Inequalities
 - Determine if an ordered pair is a solution to a system of non-linear inequalities with two variables
 - Graph the solution sets of systems of non-linear inequalities

Chapter 4: Polynomial and Rational Functions

Polynomial Functions

- Evaluate Polynomial Functions
 - Identify and evaluate polynomial functions
 - Evaluate polynomial functions for algebraic expressions
 - Use polynomial functions in applications
- Operations with Polynomial Functions and Adding Functions Graphically
 - Add and subtract polynomial functions
 - Multiply and divide polynomial functions
 - Add functions graphically

Factoring Trinomials and Polynomials

- Factoring with a Greatest Common Factor
 - Determine the greatest common factor of monomials
 - Factor polynomials using the greatest common factor
 - Use grouping to factor polynomials
- Factoring Polynomials
 - Factor the difference of squares
 - Factor the sum and difference of cubes
 - Factor special polynomials with multiple steps
- Factoring Quadratic Trinomials
 - Factor a quadratic trinomial with a leading coefficient of 1
 - Factor a quadratic trinomial with a leading coefficient of 1 and multiple variables
- Factoring Trinomials Quadratic in Form
 - Factor a trinomial with a higher degree with a leading coefficient of 1
 - Factor a quadratic trinomial with a leading coefficient greater than 1
 - Use multiple strategies to factor polynomials

Solve Polynomial Equations

- Solve a Quadratic or Polynomial Equation by Factoring
 - Solve polynomial equations given in factored form using the zero-product property
 - Solve quadratic trinomial equations by factoring
 - Solve polynomial equations by factoring
 - Find the Root of a Quadratic or Polynomial Function
 - Find the root of a quadratic function
 - Find the root of a polynomial function
 - Use factoring to solve polynomial functions in applications
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Operations on Rational Functions

- Simplify and Find the Domain of Rational Functions
 - Find the domain of rational functions
 - Simplify rational functions composed of quadratic functions
 - Simplify rational functions composed of polynomial functions
 - Use the difference quotient
- Multiply and Divide Rational Functions
 - Multiply rational functions
 - Divide rational functions
 - Simplify rational expressions using both multiplication and division
- Add and Subtract Rational Functions
 - Add and subtract rational functions
 - Add and subtract terms with negative exponents
- Simplify Complex Fractions
 - Simplify complex rational expressions
 - Simplify complex rational expressions with negative exponents

Solve Rational Equations and Variation Problems

- Solve Rational Equations
 - Solve rational equations with monomials in the denominator
 - Solve rational equations with binomials in the denominator
 - Solve rational equations with factoring to find the LCD
 - Solve rational equations using cross multiplication
- Applications of Rational Equations
 - Solve literal equations
 - Solve for an unknown number using reciprocals
 - Solve uniform motion problems
 - Solve work-rate problems
- Variation
 - Solve problems involving direct variation
 - Solve problems involving inverse variation
 - Solve problems involving joint variation

Chapter 5: Radical Functions and Equations

Radical Expressions

- Evaluate nth Roots
 - Identify and evaluate square and cube roots
 - Identify and evaluate nth roots
 - Simplify radicals with numerical radicands
 - Simplify Radical Expressions
 - Understand even and odd indices when simplifying radicals with variable radicands
 - Simplify radical expressions with square and cube roots
 - Simplify radical expressions with nth roots
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- Add and Subtract Radical Expressions
 - Perform addition and subtraction with like radicals
 - Add and subtract radical expressions with numerical radicands
 - Add and subtract radical expressions with variable radicands
- The Distance Formula and Applications
 - Use the distance formula
 - Determine if three given points form a right triangle
 - Determine the perimeter of a triangle given three points
- Multiply Radical Expressions
 - Multiply radical expressions with numerical radicands
 - Multiply radical expressions with variable radicands
 - Multiply two binomials that contain radical expressions
- Divide Radical Expressions
 - Divide radical expressions with the quotient rule for radicals
 - Rationalize a denominator with a monomial square root expression in the denominator
 - Rationalize a denominator with a monomial higher index radical expression in the denominator
 - Rationalize a denominator with a binomial in the denominator

Rules of Exponents and Rational Exponents

- Rules of Exponents
 - Simplify expressions using the product and quotient rules of exponents
 - Simplify expressions using the power rule of exponents
 - Simplify expressions with negative exponents
- Rational Exponents
 - Rewrite an expression with a rational exponent as a radical
 - Rewrite a radical expression as an expression with rational exponents
 - Evaluate expressions with a rational exponent that have a negative base
 - Simplify expressions including rational exponents
 - Simplify radical expressions with different indices

Radical Equations

- Solve Radical Equations
 - Solve equations including one square root
 - Solve equations including two square roots
 - Solve equations including cube roots

Complex Numbers

- Operations on Complex Numbers
 - Rewrite the square root of a negative number as an imaginary number
 - Add and subtract complex numbers
 - Perform multiplication with complex numbers
 - Divide complex numbers
 - Multiply the square root of negative numbers
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Chapter 6: Solving Equations and Inequalities

Extracting Square Roots and Completing the Square

- The Square Root Property
 - Solve a quadratic equation using the square root property
 - Solve a quadratic equation with a perfect square binomial using the square root property
- Completing the Square
 - Convert a quadratic in standard form to a quadratic with a perfect square binomial
 - Solve a quadratic equation by completing the square
 - Solve a quadratic equation by completing the square with an odd coefficient of x

Solve Equations with the Quadratic Formula

- The Quadratic Formula
 - Solve a quadratic equation using the quadratic formula
 - Solve a quadratic equation not given in standard form using the quadratic formula
 - Determine the type and number of solutions of a quadratic equation
- Solve Equations Quadratic in Form
 - Solve an equation with rational or negative exponents by writing in quadratic form
 - Solve other equations by writing in quadratic form
 - Solve a cubic polynomial and understand the fundamental theorem of algebra

Quadratic Functions and Their Graphs

- Quadratic Functions and the Parabola
 - Determine the x and y intercepts of a parabola
 - Find the vertex and the axis of symmetry of a parabola
 - Graph a parabola from a quadratic function given in standard form
 - Find the maximum or minimum of a quadratic function
- Vertex Form of a Quadratic Function
 - Find the vertex and graph a parabola from a quadratic function given in vertex form
 - Write a quadratic function in vertex form by completing the square

Quadratic Inequalities

- Find the Solution Set of a Quadratic Inequality
 - Determine the solution set of a quadratic inequality from a graph
 - Solve a quadratic inequality in one variable by factoring
 - Solve a quadratic inequality in one variable with the quadratic formula
 - Find the domain of a radical function with a quadratic radicand

Polynomial and Rational Inequalities

- Solve Polynomial Inequalities
 - Solve a polynomial inequality given in factored form
 - Solve a polynomial inequality requiring factoring to solve
 - Solve Rational Inequalities
 - Solve a rational inequality with only one rational expression
 - Solve a rational inequality with two rational expressions
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Chapter 7: Exponential and Logarithmic Functions

Composite Functions and Inverse Functions

- Composite Functions
 - Perform a composition of functions with two functions
 - Compose a function with itself
- Inverse Functions
 - Verify that two functions are inverses of each other
 - Determine if a function is a one-to-one function
 - Find the inverse of a linear or quadratic function algebraically
 - Find the inverse of other types of functions algebraically

Exponential Functions

- Graphs of Exponential Functions
 - Determine the domain and range of an exponential function and recognize its graph
 - Graph an exponential function with fractional bases or involving reflections
 - Graph an exponential function with the natural base
- Compound Interest
 - Use the compound interest formula
 - Use the continuously compounding interest formula

Logarithmic Functions

- Definition of the Logarithm
 - Understand the definition of the logarithm and convert between exponential and logarithmic form
 - Evaluate common or natural logarithms without the use of a calculator
 - Solve a simple common or natural logarithmic equation by rewriting in exponential form
- Graphs of Logarithmic Functions
 - Determine the domain and range of a logarithmic function with a base greater than 1 and recognize its graph
 - Graph a logarithmic function with a fractional base

Properties of the Logarithm

- The Inverse Properties of Logarithms and Expanding and Contracting Logarithms
 - Apply the inverse properties of the logarithm
 - Apply the product or quotient property of logarithms to simplify a logarithmic expression
 - Apply the power property of logarithms to simplify a logarithmic expression
 - Use the properties of logarithms to expand a logarithmic expression
 - Use the properties of logarithms to condense a logarithmic expression

Exponential and Logarithmic Equations

- Solving Exponential Equations and the Change of Base Formula
 - Solve an exponential equation with the one-to-one property of exponential functions
 - Solve an exponential equation with logarithms
 - Evaluate a logarithm using the change of base formula
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- Solving Logarithmic Equations
 - Solve a logarithmic equation with the one-to-one property of logarithmic functions
 - Solve a logarithmic equation requiring the properties of logarithms
 - Find the inverse of a logarithmic function

Applications of Exponential and Logarithmic Functions

- Exponential Growth and Decay
 - Use the compound interest formula to determine the time for an investment to yield a given amount
 - Use the continuous compound interest formula to determine the time for an investment to yield a given amount
 - Use the exponential growth formula to investigate population growth and other applications
 - Use the exponential decay formula to investigate radioactive decay and other applications

Chapter 8: Conic Sections and Nonlinear Systems

Conic Sections

- Parabolas
 - Convert the equation of a parabola from general form to standard form and find the vertex of a parabola
 - Use both general and standard forms of a quadratic equation to graph and find key points of a parabola
 - Graph a parabola that opens to the left or the right
 - Use the distance and midpoint formulas to find the center and radius of circles
 - Circles
 - Graph a circle and determine the radius and center given the equation in standard form
 - Find the intercepts of a circle given the equation in standard form
 - Write the equation of a circle in standard form given the center and radius or points on the circle
 - Write the equation of a circle given in general form as an equation in standard form
 - Graph a circle given the equation in general form
 - Ellipses
 - Write the equation for an ellipse in standard form given key points
 - Graph an ellipse given an equation in standard form
 - Find the intercepts of an ellipse given an equation in standard form
 - Write the equation of an ellipse given in general form as an equation in standard form
 - Graph an ellipse given an equation in general form
 - Hyperbolas
 - Write the equation for a hyperbola in standard form given key points
 - Graph a hyperbola given an equation in standard form
 - Find the intercepts of a hyperbola given an equation in standard form
 - Graph a hyperbola given an equation in general form
 - Identify a conic section given its equation in general form
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Systems of Equations with Conic Sections

- Nonlinear Systems of Equations
 - Solve a nonlinear system of equations given a circle and a line
 - Solve a nonlinear system of equations given a circle and a parabola

Chapter 9: The Binomial Theorem and Sequences and Series

Sequences and Series

- Introduction to Sequences and Series
 - Find terms of a sequence given the general term of a sequence
 - Find terms of a sequence given a recurrence relation
 - Determine the partial sum of a sequence
 - Write an infinite series in expanded form
- Arithmetic Sequences
 - Find an equation for the general term of an arithmetic sequence
 - Find a term or an equation for an arithmetic sequence given two terms in the sequence
- Arithmetic Series
 - Find a partial sum of an arithmetic sequence
 - Use the partial sum of an arithmetic sequence in applications
- Geometric Sequences
 - Find an equation for the general term of a geometric sequence
 - Find a term or an equation for a geometric sequence given two terms in the sequence
- Geometric Series
 - Find a partial sum of a finite geometric sequence
 - Find the sum of an infinite geometric series
 - Write a repeating decimal as a fraction using infinite series or use geometric series in applications

The Binomial Theorem

- Factorials and the Binomial Theorem
 - Evaluate an expression involving factorials
 - Calculate a binomial coefficient
 - Expand powers of binomials using the binomial theorem or Pascal's triangle
 - Expand powers of binomials with negative terms or a coefficient greater than 1
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