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Intermediate Algebra

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Openstax	Lyn Marecek, MaryAnne Anthony-Smith	Intermediate Algebra	Intermediate Algebra
Mathispower4u	James Sousa	MathIsPower4U	Mathispower4u Videos

Alta 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: OpenStax, 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.

Alta Intermediate Algebra has two instructional sequences for every learning objective, giving students multiple opportunities to learn new concepts. Between our OpenStax text, video content, and Knewton SMEs, we were able to solicit ideas from math instructors and students at all levels of higher education. Alta 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 | Table of Contents

- Using the Properties of Real Numbers
    - Understand and use the commutative and associative properties
    - Use the properties of identity, inverse, and zero
    - Simplify an expression using the distributive property

Chapter 2: Solving Linear Equations and Inequalities

2.1 Use a General Strategy to Solve Linear Equations

- Solving Linear Equations in One Variable
    - Determine if a value is the solution to an equation
    - Use a general strategy to solve a linear equation
    - Determine if an equation is a contradiction, identity, or conditional equation
- Solving Linear Equations with Fraction and Decimal Coefficients
    - Solve an equation with fractional coefficients
    - Solve an equation with decimal coefficients

2.2 Use a Problem Solving Strategy

- An Introduction to Problem Solving
    - Develop a problem-solving strategy for word problems
    - Solve number word problems
- Percent Change and Interest Applications
    - Solve percent application problems
    - Solve problems involving percent change
    - Solve simple interest applications

2.3 Solve a Formula for a Specific Variable

- Literal Equations and Using Formulas with Geometry
    - Solve a formula for a specified variable
    - Use a formula to solve a geometric application
    - Use the Pythagorean theorem

2.4 Solve Mixture and Uniform Motion Applications

- Mixture Problems with Coins, Tickets, or Stamps
    - Solve a word problem involving coins
    - Solve a word problem involving tickets or stamps
- Mixture Word Problems and Uniform Motion
    - Solve a mixture word problem
    - Solve applications involving uniform motion

2.5 Solve Linear Inequalities

- Solving Linear Inequalities
    - Graph an inequality on a number line and use interval notation (*31)
    - Solve a linear inequality that requires only one step
    - Solve a linear inequality that requires multiple steps to solve
    - Translate words to an inequality and solve applications with linear inequalities

2.6 Solve Compound Inequalities
- Solving Compound Inequalities
    - Solve a compound inequality involving intersections
    - Solve a compound inequality involving unions
    - Solve applications with compound inequalities

2.7 Solve Absolute Value Equations and Inequalities
- Solving Absolute Value Equations and Inequalities
    - Solve an absolute value equation
    - Solve an absolute value inequality involving "less than"
    - Solve an absolute value inequality involving "greater than"
    - Solve applications with absolute value

Chapter 3: Graphs and Functions

3.1 Graph Linear Equations in Two Variables
- The Rectangular Coordinate System and Graphing Linear Equations
    - Plot points on the rectangular coordinate system and identify the quadrants of points (*56)
    - Understand the standard form of a linear equation and verify solutions given points
    - Graph linear equations by plotting points (*58)
    - Graph horizontal and vertical lines (*58)
- Graphing Linear Equations with Intercepts
    - Find the intercepts of a line from a graph or an equation
    - Graph a line using intercepts (*57)

3.2 Slope of a Line
- The Slope of a Line
    - Find the slope of a line using the relationship between rise and run
    - Find the slope of a line given two points on the line
- Graphing Linear Equations with Slope
    - Graph a line given the slope and a point (*57)
    - Identify the slope and intercept of a line from its equation and use it to graph the line (*37)
    - Graph a linear equation using a variety of methods
- Applications of Slope and Parallel and Perpendicular Lines
    - Interpret applications using graphs and slope
    - Determine if two lines are parallel or perpendicular by comparing slopes

3.3 Find the Equation of a Line
- Equations of Lines
    - Find the equation of a line given the y-intercept and the slope
    - Find the equation of a line given a point on the line and the slope
    - Find the equation of a line given two points on the line
- Equations of Parallel and Perpendicular Lines
    - Find the equation of a line parallel to a given line
    - Find the equation of a line perpendicular to a given line

3.4 Graph Linear Inequalities in Two Variables
- Graphing Linear Inequalities
    - Verify that a given point is a solution to an inequality in two variables
    - Write a linear inequality given its graph
    - Graph a linear inequality in two variables (*57)
    - Solve applications using linear inequalities in two variables

3.5 Relations and Functions
- Introduction to Functions
    - Find the domain and range of a relation
    - Determine if a relation is a function given a set of ordered pairs or a mapping
    - Determine if a relation is a function given an equation
- Function Notation
    - Use function notation to find the value of a function given a number
    - Use function notation to find the value of a function given a variable expression

3.6 Graphs of Functions
- The Vertical Line Test and Graphs of Functions
    - Use the vertical line test to determine if a graph represents a function
    - Identify graphs of basic functions
    - Read information from the graph of a function

Chapter 4: Systems of Linear Equations and Inequalities

4.1 Solve Systems of Linear Equations with Two Variables
- Solving Systems of Linear Equations in Two Variables by Graphing
    - Determine if an ordered pair is a solution of a system of linear equations
    - Solve systems of linear equations by graphing (*13)
    - Identify inconsistent and dependent systems of equations with two variables
- Solving Systems of Linear Equations in Two Variables Algebraically
    - Solve a system of linear equations using the substitution method
    - Solve a system of linear equations using the elimination method
    - Choose the most convenient method to solve a system of linear equations

4.2 Solve Applications with Systems of Equations
- Systems of Linear Equations in Two Variables and Problem Solving
    - Solve word problems and applications using a system of linear equations
    - Solve geometric application problems using systems of equations
    - Solve applications of uniform motion using systems of equations

4.3 Solve Mixture Applications with Systems of Equations
- Mixture Problems and Systems of Linear Equations in Two Variables
    - Solve applications of mixture involving tickets or money with a system of linear equations
    - Solve applications of mixture involving concentrations using a system of linear equations
    - Solve applications involving the simple interest formula using a system of linear equations
    - Solve applications of cost and revenue functions using a system of linear equations

4.4 Solve Systems of Equations with Three Variables
- Solving Systems of Linear Equations in Three Variables
    - Determine whether an ordered triple is a solution of a system of three linear equations with three variables
    - Solve a system of linear equations with three variables
    - Identify inconsistent and dependent systems of equations with three variables
    - Solve applications using systems of linear equations in three variables

4.5 Solve Systems of Equations Using Matrices
- Solving Systems of Linear Equations with Matrix Row Operations
    - Write the augmented matrix for a system of equations
    - Use row operations on a matrix
    - Solve a system of equations using matrices

4.6 Solve Systems of Equations Using Determinants
- Determinants of Matrices
    - Evaluate the determinant of a 2x2 matrix
    - Evaluate the minor of an element in a 3x3 matrix
    - Evaluate the determinant of a 3x3 matrix
- Solving Systems of Linear Equations with Cramer's Rule and Determinants
    - Use Cramer's Rule to solve systems of equations in two variables
    - Use Cramer's Rule to solve systems of equations in three variables
    - Use determinants to determine if three given points are collinear

4.7 Graphing Systems of Linear Inequalities
- Solving Systems of Linear Inequalities
    - Determine if an ordered pair is a solution of a system of linear inequalities
    - Solve systems of linear inequalities by graphing (*37)
    - Solve an application using systems of linear inequalities

Chapter 5: Polynomials and Polynomial Functions

5.1 Add and Subtract Polynomials
- Adding and Subtracting Polynomials and Polynomial Functions
    - Determine the degree and type of a given polynomial and write it in standard form
    - Add or subtract polynomial expressions
    - Evaluate a polynomial function for a given value
    - Add or subtract polynomial functions

5.2 Properties of Exponents and Scientific Notation
- Simplifying Expressions with Properties of Exponents and Negative Exponents
    - Use the product property of exponents to simplify expressions
    - Use the quotient property and the zero property of exponents to simplify expressions
    - Rewrite expressions with positive exponents using the definition of negative exponents
    - Use the power property for exponents and extensions to products and quotients to simplify expressions
    - Simplify exponential expressions by combining all properties

- Scientific Notation
    - Convert between decimal notation and scientific notation
    - Multiply and divide expressions given in scientific notation

5.3 Multiply Polynomials

- Multiplying Polynomials
    - Multiply monomials and multiply a polynomial by a monomial
    - Multiply two binomials
    - Multiply a polynomial by a polynomial
- Special Products of Binomials and Multiplying Polynomial Functions
    - Use the binomial squares pattern to square a binomial
    - Use the conjugate pairs pattern to multiply conjugates
    - Multiply polynomial functions

5.4 Dividing Polynomials

- Dividing Polynomials and Polynomial Functions
    - Divide monomials and divide a polynomial by a monomial
    - Use polynomial long division to divide polynomials
    - Divide polynomial functions
- Synthetic Division and the Remainder and Factor Theorems
    - Use synthetic division to divide polynomials
    - Use the remainder and factor theorems

Chapter 6: Factoring

6.1 Greatest Common Factor and Factor by Grouping

- The Greatest Common Factor and Factoring by Grouping
    - Find the greatest common factor of monomial expressions
    - Factor the greatest common factor from polynomial expressions
    - Factor polynomials by grouping

6.2 Factor Trinomials

- Factoring Trinomials
    - Factor a trinomial with a leading coefficient of 1
    - Factor a trinomial with a leading coefficient of greater than 1 using trial and error
    - Factor a trinomial with a leading coefficient of greater than 1 using the 'ac' method
    - Factor a trinomial in a quadratic form using substitution

6.3 Factor Special Products

- Factoring Special Products
    - Factor polynomials using a perfect squares binomial pattern
    - Factor polynomials using a difference of squares pattern
    - Factor polynomials by combining the difference of squares and perfect square trinomial patterns
    - Factor a sum or a difference of cubes

6.4 General Strategy for Factoring Polynomials

- Choosing a Factoring Strategy
    - Use a general strategy for factoring polynomials

6.5 Polynomial Equations

- Solving Polynomial Equations by Factoring
    - Use the zero product property to solve a factored polynomial equation
    - Solve polynomial equations by factoring
    - Find zeros and intercepts of a polynomial function by factoring
    - Use factoring to solve application problems involving polynomial equations

Chapter 7: Rational Expressions and Functions

7.1 Multiply and Divide Rational Expressions

- Domain of Rational Expressions and Simplifying Rational Expressions
    - Determine which values make a rational expression undefined
    - Simplify rational expressions
- Multiplying and Dividing Rational Expressions
    - Multiply two rational expressions
    - Divide rational expressions, including those written as complex fractions
    - Multiply and divide rational functions

7.2 Add and Subtract Rational Expressions

- Adding and Subtracting Rational Expressions
    - Add or subtract rational expressions with a common denominator or with denominators that are opposites
    - Determine the least common denominator of rational expressions
    - Add or subtract rational expressions with unlike denominators
    - Add and subtract rational functions

7.3 Simplify Complex Rational Expressions

- Simplifying Complex Rational Expressions
    - Simplify complex rational expressions by writing the expression as division
    - Simplify complex rational expressions by using the least common denominator

7.4 Solve Rational Equations

- Solving Rational Equations and Using Rational Functions
    - Solve rational equations
    - Use rational equations to find points on the graph of a rational function
    - Rewrite a rational equation in terms of a specific variable

7.5 Solve Applications with Rational Equations

- Proportions and Similar Figures with Rational Equations
    - Solve problems involving proportions
    - Solve application problems involving similar figures
- Uniform Motion, Work, and Problem Solving
    - Use rational equations to solve uniform motion applications
    - Use rational equations to solve problems involving rates of work
- Variation and Problem Solving
    - Solve problems involving direct variation
    - Solve problems involving inverse variation

7.6 Solve Rational Inequalities
- Solving Rational Inequalities
    - Find the solution set of a rational inequality
    - Solve an inequality with rational functions

Chapter 8: Roots and Radicals

8.1 Simplify Expressions with Roots
- Understanding Radical Expressions
    - Simplify a numerical expression with even or odd roots
    - Estimate and approximate roots
    - Simplify a variable expression with even or odd roots

8.2 Simplify Radical Expressions
- Simplifying Radical Expressions
    - Use the product property to simplify radical expressions
    - Use the quotient property to simplify radical expressions

8.3 Simplify Rational Exponents
- Rational Exponents
    - Simplify an expression with rational exponents and a numerator of 1
    - Simplify an expression with rational exponents and a numerator greater than 1
    - Use the properties of exponents to simplify expressions with rational exponents

8.4 Add, Subtract, and Multiply Radical Expressions
- Operations with Radical Expressions
    - Add and subtract radical expressions
    - Multiply radical expressions
    - Use polynomial multiplication to multiply radical expressions
    - Use special product formulas to multiply radical expressions

8.5 Divide Radical Expressions
- Dividing Radical Expressions and Rationalizing Denominators
    - Divide radical expressions
    - Rationalize a denominator when the denominator is a monomial
    - Rationalize a denominator when the denominator is a binomial

8.6 Solve Radical Equations
- Solving Radical Equations
    - Solve square root equations containing a single radical
    - Solve a radical equation with a single radical or an equation with a rational exponent
    - Solve a radical equation with two radicals
    - Solve application problems involving radical equations

8.7 Use Radicals in Functions
- Radical Functions
    - Evaluate a radical function
    - Find the domain of a radical function
    - Graph a radical function by plotting points and determine its range (*23)

8.8 Use the Complex Number System
- Introduction to Complex Numbers
    - Evaluate the square root of a negative number and understand the complex number system
    - Add or subtract complex numbers
- Multiplying and Dividing Complex Numbers and Powers of i
    - Multiply complex numbers
    - Multiply two complex conjugates
    - Divide complex numbers
    - Simplify powers of i

Chapter 9: Quadratic Equations and Functions

9.1 Solve Quadratic Equations Using the Square Root Property
- Solving Quadratic Equations Using the Square Root Property
    - Solve quadratic equations using the square root property
    - Solve quadratic equations with a binomial as the quadratic term using the square root property

9.2 Solve Quadratic Equations by Completing the Square
- Solving Quadratic Equations by Completing the Square
    - Find the term that completes the square of a quadratic expression
    - Solve quadratic equations with a leading coefficient of 1 by completing the square
    - Solve quadratic equations with a leading coefficient greater than 1 by completing the square

9.3 Solve Quadratic Equations Using the Quadratic Formula
- Solving Quadratic Equations Using the Quadratic Formula
    - Solve quadratic equations using the quadratic formula with two real solutions
    - Solve quadratic equations using the quadratic formula with one or no real solutions
    - Determine the number and type of solutions of a quadratic equation by using the discriminant

9.4 Solve Quadratic Equations in Quadratic Form
- Solving Equations by Using Quadratic Methods
    - Solve an equation in quadratic form by using substitution
    - Solve an equation in quadratic form with rational or negative exponents by using substitution

9.5 Solve Applications of Quadratic Equations
- Problem Solving with Quadratic Equations
    - Solve an application problem modeled by a quadratic equation
    - Solve a geometric application problem where the quadratic formula may be required

9.6 Graph Quadratic Functions Using Properties
- Parabolas and Their Properties
    - Graph a quadratic function by plotting points and determine the direction a parabola opens (*21)
    - Determine the axis of symmetry and vertex of a parabola given a function
    - Determine the intercepts of a parabola given a function

- Graphing Quadratic Functions
    - Graph a quadratic function by finding key points (*42)
    - Determine the minimum or maximum of a quadratic function and use it in applications

9.7 Graph Quadratic Functions Using Transformations

- Transformations of Parabolas
    - Graph a quadratic function using a vertical translation (*22)
    - Graph a quadratic function using a horizontal translation (*23)
    - Graph a quadratic function by compression, stretching, or reflecting (*22)
- Graphing Quadratic Functions Using Transformations
    - Rewrite a quadratic in vertex form and graph it using transformations (*11)
    - Find a quadratic function given its graph

9.8 Solve Quadratic Inequalities

- Solving Quadratic Inequalities
    - Solve a quadratic inequality graphically
    - Solve a quadratic inequality algebraically

Chapter 10: Exponential and Logarithmic Functions

10.1 Finding Composite and Inverse Functions

- Composite Functions
    - Perform a composition of functions
    - Evaluate a composition of functions for a specific value
- One-to-One Functions
    - Determine whether a function is one-to-one given a set of ordered pairs
    - Use the horizontal line test to determine whether a graph represents a one-to-one function
- Inverse Functions
    - Find the inverse of a function given a set of ordered pairs or a graph
    - Verify that two functions are inverses of each other
    - Find the inverse of a function algebraically

10.2 Evaluate and Graph Exponential Functions

- Graphing Exponential Functions
    - Graph an exponential function and understand its properties (*14)
    - Graph an exponential function using transformations (*22)
    - Evaluate an exponential function with base e and understand the natural base
- Applications with Exponential Functions
    - Use the one-to-one property of exponential equations to solve an exponential equation
    - Use the compound interest formula to find the new value of an account
    - Use the continuously compounding interest formula to find the new value of an account
    - Calculate resultant values using exponential growth and decay models

10.3 Evaluate and Graph Logarithmic Functions

- Introduction to Logarithms
    - Convert between exponential and logarithmic form
    - Evaluate a logarithmic function

- Logarithmic Functions and Applications
    - Graph a logarithmic function and understand its properties (*15)
    - Solve a logarithmic equation by rewriting the equation in exponential form
    - Use logarithmic models in applications

10.4 Use the Properties of Logarithms

- Understanding the Properties of Logarithms
    - Use basic properties of logarithms and the inverse properties of logarithms
    - Use the product, quotient, and power properties of logarithms
- Using the Properties of Logarithms
    - Use the properties of logarithms to expand a logarithmic expression
    - Use the properties of logarithms to condense a logarithmic expression
    - Use the change-of-base formula for logarithms

10.5 Solve Exponential and Logarithmic Equations

- Solving Logarithmic Equations
    - Use the one-to-one property of logarithmic equations to solve logarithmic equations
    - Use the properties of logarithms to solve logarithmic equations
- Solving Exponential Equations and Applications
    - Solve exponential equations using logarithms
    - Solve for amounts other than a new balance with the compound or continuously compounding interest formula
    - Use the exponential growth and decay models to find values other than the resultant value

Chapter 11: Conics

11.1 Distance and Midpoint Formulas and Circles

- The Distance and Midpoint Formulas
    - Use the distance formula to find the distance between two points
    - Use the midpoint formula to find the midpoint between two points (*10)
- The Equation of Circles
    - Write the standard form of the equation of a circle given its center and radius
    - Write the standard form of the equation of a circle given its center and a point on the circle
    - Graph a circle given its equation in standard form (*21)
    - Rewrite the equation of a circle given in general form by completing the square (*11)

11.2 Parabolas

- Parabolas as Conic Sections and Applications
    - Graph a vertical parabola given the equation in general or standard form (*24)
    - Graph a horizontal parabola given the equation in general form (*12)
    - Graph a horizontal parabola given the equation in standard form (*21)
    - Solve applications with parabolas

11.3 Ellipses

- Ellipses with Centers at the Origin
    - Graph an ellipse with its center at the origin (*23)
    - Find the equation of an ellipse with its center at the origin

- Ellipses with Centers Not at the Origin and Applications
    - Graph an ellipse with its center not at the origin (*22)
    - Rewrite the equation of an ellipse given in general form by completing the square (*11)
    - Solve applications with ellipses

11.4 Hyperbolas

- Hyperbolas as Conic Sections
    - Graph a hyperbola with its center at the origin (*23)
    - Graph a hyperbola with its center not at the origin (*22)
    - Rewrite the equation of a hyperbola given in general form by completing the square (*11)
- Identifying Conic Sections by Their Equations
    - Identify conic sections by their equations

11.5 Solve Systems of Nonlinear Equations

- Solving Systems of Nonlinear Equations
    - Solve a system of nonlinear equations by graphing
    - Solve a system of nonlinear equations using substitution
    - Solve a system of nonlinear equations using elimination
- Problem Solving with Systems of Nonlinear Equations
    - Use a system of nonlinear equations to solve applications

Chapter 12: Sequences, Series, and the Binomial Theorem

12.1 Sequences

- Introduction to Sequences
    - Write the first few terms of a sequence
    - Find a formula for the general term of a sequence
- Factorial Notation and Sigma Notation
    - Use factorial notation
    - Find the partial sum
    - Use summation notation to write a sum

12.2 Arithmetic Sequences and Series

- Arithmetic Sequences and Series
    - Determine if a sequence is arithmetic and write the first few terms of an arithmetic sequence
    - Find the general term of an arithmetic sequence
    - Find the sum of the first n terms of an arithmetic sequence

12.3 Geometric Sequences and Series

- Geometric Sequences
    - Determine if a sequence is geometric and write the first few terms of a geometric sequence
    - Find the general term of a geometric sequence
- Finite and Infinite Geometric Series and Applications
    - Find the sum of the first n terms of a geometric sequence
    - Find the sum of an infinite geometric series and use infinite geometric series to write a repeating decimal as a fraction
    - Use geometric sequences and series to solve monetary applications including annuities

12.4 Binomial Theorem

- The Binomial Theorem
    - Use Pascal's Triangle to expand a binomial
    - Evaluate a binomial coefficient
    - Use the binomial theorem to expand a binomial