algebra 2

Content, Standards & Objectives

This document contains an ordered list of all of the topics from the scope and sequence of Thinkwell's Algebra 2, along with the learning objectives covered in each topic and the corresponding standards.

Although Thinkwell's Algebra 2 was not designed as a common core curriculum, this document is provided for those customers whose state homeschool requirements include common core standard mapping information.

Example:

Topic's number and title ⟶ **3.1.4 Linear Programming**

Learning Objectives:

Topic's learning objectives ⟶ • *Write constraints and graph feasible regions.*
• *Use linear programming to answer real-world questions.*

Topic's related standards from
the Common Core State Standards
for Mathematics ⟶ **Standards:**
A-CED: 3, A-REI: 5, A-REI: 12, F-IF: 7, F-BF: 1, F-BF: 1a, Q.A.2

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Algebra 2
Content, Standards, & Objectives

thinkwell homeschool

1 Foundations for Functions

1.1 Properties and Operations

1.1.1 Sets of Numbers

Learning Objectives:

• Order and classify real numbers.
• Use interval notation to represent a set of numbers.
• Translate between methods of set notation.

1.1.2 Properties of Real Numbers

Learning Objectives:

• Identify and use properties of real numbers.
• Use mental math in real-world applications.
• Classify statements as sometimes, never, or always true.

Standards:
A-SSE: 2, A-SSE: 3, A-APR: 1

1.1.3 Square Roots
Learning Objectives:

• Estimate square roots.
• Simplify square root expressions.
• Add, subtract, multiply, and divide square roots.

1.1.4 Simplifying Algebraic Expressions

Learning Objectives:

• Translate words into algebraic expressions.
• Evaluate algebraic expressions.
• Simplify algebraic expressions.
• Write, simplify, and evaluate algebraic expressions in real-world applications.

Standards:
A-SSE: 1, A-SSE: 1.a, A-APR: 1, F-BF: 1a, Q.A.2

1.1.5 Properties of Exponents and Scientific Notation

Learning Objectives:

• Write exponential expressions in expanded form.
• Simplify expressions involving exponents.
• Simplify expressions involving scientific notation.

1.2 Introduction to Functions

1.2.1 Relations and Functions

Learning Objectives:

• *Identify domain and range for relations.*
• *Determine whether relations are functions.*
• *Use the Vertical Line Test to determine whether a relation is a function.*

Standards:
F-IF: 1, F-IF: 5

1.2.2 Function Notation

Learning Objectives:

• *Evaluate functions.*
• *Write functions using function notation.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-CED: 2, F-IF: 7, F-BF: 1, F-BF: 1a, Q.A.2

1.2.3 Exploring Transformations

Learning Objectives:

• *Apply transformations to points and functions.*
• *Interpret transformations of real-world data.*

Standards:
F-IF: 4, F-BF: 3, G-CO: 2

1.2.4 Introduction to Parent Functions

Learning Objectives:

• *Identify parent functions from graphs and equations.*
• *Identify transformations of parent functions.*
• *Use parent functions to model real-world data sets and make estimates for unknown values.*

Standards:
F-IF: 4, F-IF: 7, F-BF: 3

2 Linear Functions

2.1 Linear Equations and Inequalities

2.1.1 Solving Linear Equations and Inequalities

Learning Objectives:

- *Write and solve linear equations using a variety of methods.*
- *Solve linear equations with variables on both sides.*
- *Identify identities and contradictions.*
- *Solve and graph linear inequalities.*

Standards:
A-CED: 3, A-REI: 3, F-BF: 1a, Q.A.2

2.1.2 Proportional Reasoning

Learning Objectives:

- *Solve proportions.*
- *Solve percent problems using various methods.*
- *Scale geometric figures in the coordinate plane.*
- *Apply proportional relationships to rates, similarity, and scale.*

Standards:
F-BF: 1a, Q.A.2

2.1.3 Graphing Linear Functions

Learning Objectives:

- *Determine whether functions are linear.*
- *Graph linear functions given two points, a table, an equation, or a point and a slope.*
- *Graph linear functions using the intercepts.*
- *Graph vertical and horizontal lines.*

Standards:
A-CED: 2, F-IF: 4, F-IF: 7, F-IF: 7a, F-IF: 8, F-BF: 1a, F-LE: 1b

2.1.4 Writing Linear Functions

Learning Objectives:

- *Use slope-intercept form and point-slope form to write linear functions.*
- *Find the slope of a line given two or more points.*
- *Write linear functions to solve problems.*
- *Write equations of parallel and perpendicular lines.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-CED: 2, A-CED: 3, F-IF: 2, F-IF: 4, F-BF: 1, F-BF: 1a, F-LE: 2, G-GPE: 5, Q.A.2

2.1.5 Linear Inequalities in Two Variables

Learning Objectives:

• *Graph linear inequalities on the coordinate plane using various methods.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-CED: 3, F-IF: 4, F-IF: 7, F-IF: 8, F-BF: 1, Q.A.2

2.2 Applying Linear Functions

2.2.1 Transforming Linear Functions

Learning Objectives:

• *Translate, rotate, and reflect linear functions.*
• *Describe transformations of linear functions.*
• *Perform multiple transformations of linear functions.*
• *Write equations of transformed functions.*

Standards:
A-CED: 2, F-IF: 2, F-IF: 7, F-BF: 3, G-CO: 2

2.2.2 Curve Fitting With Linear Models

Learning Objectives:

• *Fit scatter plot data using linear models with and without technology.*
• *Use linear models to make predictions.*

Standards:
A-SSE: 1, A-SSE: 1.a, F-BF: 1, S-ID: 6, S-ID: 6a, S-ID: 6c, S-ID: 8

2.2.3 Solving Absolute-Value Equations and Inequalities

Learning Objectives:

• *Solve compound inequalities.*
• *Write and solve absolute-value equations and inequalities.*
• *Solve and graph absolute-value inequalities with disjunctions and conjunctions.*

2.2.4 Absolute-Value Functions

Learning Objectives:

• *Graph and transform absolute-value functions.*
• *Write rules for transformed absolute-value functions.*

Standards:
A-CED: 2, F-IF: 7, F-BF: 3

3 Linear Systems

3.1 Linear Systems in Two Dimensions

3.1.1 Using Graphs and Tables to Solve Linear Systems

Learning Objectives:

• *Verify solutions of linear systems.*
• *Solve linear systems by using graphs and tables.*
• *Classify systems of equations and determine the number of solutions.*
• *Write and solve systems of equations.*

Standards:
A-CED: 2, A-CED: 3, A-REI: 6, A-REI: 11, F-IF: 7, F-BF: 1, F-BF: 1a, F-LE: 1b, F-LE: 2, Q.A.2

3.1.2 Using Algebraic Methods to Solve Linear Systems

Learning Objectives:

• *Solve linear systems by substitution or elimination.*
• *Classify systems with infinitely many solutions or no solution.*
• *Write and solve linear systems.*

Standards:
A-CED: 3, A-REI: 5, A-REI: 6, A-REI: 11, F-BF: 1, F-BF: 1a, F-LE: 2, Q.A.2

3.1.3 Solving Systems of Linear Inequalities

Learning Objectives:

• *Graph systems of linear inequalities.*
• *Write and solve systems of linear inequalities.*
• *Classify figures created by solution regions.*

Standards:
A-SSE: 1, A-CED: 3, A-REI: 12, F-IF: 4, F-IF: 7, F-BF: 1, F-BF: 1a, Q.A.2

3.1.4 Linear Programming

Learning Objectives:

• *Write constraints and graph feasible regions.*
• *Use linear programming to answer real-world questions.*

Standards:
A-CED: 3, A-REI: 5, A-REI: 12, F-IF: 7, F-BF: 1, F-BF: 1a, Q.A.2

4 Matrices

4.1 Matrix Operations

4.1.1 Matrices and Data

Learning Objectives:

- *Use matrices to display mathematical and real-world data.*
- *Find sums, differences, and scalar products of matrices.*

Standards:
F-BF: 1a, VM.C.6, VM.C.7, VM.C.8

4.1.2 Multiplying Matrices

Learning Objectives:

- *Identify and find matrix products.*
- *Find powers of square matrices.*

Standards:
F-BF: 1a, VM.C.6, VM.C.7, VM.C.8, VM.C.9

4.1.3 Using Matrices to Transform Geometric Figures

Learning Objectives:

- *Use matrices to transform plane figures.*

Standards:
G-CO: 2, VM.C.7, VM.C.8, VM.C.12, G-CO: 6

5 Quadratic Functions

5.1 Quadratic Functions and Complex Numbers

5.1.1 Using Transformations to Graph Quadratic Functions

Learning Objectives:

• *Transform quadratic functions.*
• *Describe the effects of changes in the coefficients of $y = a(x - h)^2 + k$.*
• *Write transformed quadratic functions.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-CED: 2, F-IF: 2, F-IF: 7, F-BF: 3, G-CO: 2

5.1.2 Properties of Quadratic Functions in Standard Form

Learning Objectives:

• *Define, identify, and graph quadratic functions.*
• *Identify and use maximums and minimums of quadratic functions to solve problems.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-SSE: 2, A-CED: 2, F-IF: 1, F-IF: 2, F-IF: 7, F-IF: 7a

5.1.3 Solving Quadratic Equations by Graphing and Factoring

Learning Objectives:

• *Solve quadratic equations by graphing or factoring.*
• *Determine a quadratic function from its roots.*

Standards:
A-SSE: 1, A-SSE: 2, A-SSE: 3.a, A-APR: 1, A-CED: 2, A-REI: 4, A-REI: 4b, F-IF: 2, F-IF: 7, F-IF: 7a, F-IF: 8, F-IF: 8a

5.1.4 Completing the Square

Learning Objectives:

• *Solve quadratic equations by using the Square Root Property.*
• *Solve quadratic equations by completing the square.*
• *Write quadratic equations in vertex form.*

Standards:
A-SSE: 2, A-SSE: 3.b, A-REI: 4, A-REI: 4a, A-REI: 4b, F-IF: 8

5.1.5 Complex Numbers and Roots

Learning Objectives:

• *Define and use imaginary and complex numbers.*
• *Solve quadratic equations with complex roots.*

Standards:
A-REI: 4, A-REI: 4a, A-REI: 4b, F-IF: 8, CN.A.1, CN.A.2, CN.A.3, CN.C.7

5.1.6 The Quadratic Formula

Learning Objectives:

- *Solve quadratic equations using the Quadratic Formula.*
- *Classify roots using the discriminant.*

Standards:

A-SSE: 1, A-REI: 4, A-REI: 4b, F-IF: 2, F-BF: 1a, CN.A.1, CN.A.2, CN.C.7

5.2 Applying Quadratic Functions

5.2.1 Solving Quadratic Inequalities

Learning Objectives:

- *Solve quadratic inequalities by using tables and graphs.*
- *Solve quadratic inequalities by using algebra.*

Standards:

A-SSE: 1, A-SSE: 1.a, A-SSE: 2, A-CED: 3, F-IF: 2

5.2.2 Curve Fitting with Quadratic Models

Learning Objectives:

- *Identify quadratic data.*
- *Use quadratic functions to model data.*

Standards:

A-SSE: 1, A-CED: 2, F-BF: 1, S-ID: 6a

5.2.3 Operations with Complex Numbers

Learning Objectives:

- *Graph complex numbers.*
- *Perform operations with complex numbers.*

Standards:

A-SSE: 2, CN.A.1, CN.A.2, CN.A.3

6 Polynomial Functions

6.1 Operations with Polynomials

6.1.1 Polynomials

Learning Objectives:

- *Find the degree of polynomials.*
- *Write polynomials in standard form.*
- *Identify the leading coefficient of polynomials.*
- *Classify polynomials.*
- *Evaluate polynomials.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-APR: 1

6.1.2 Adding and Subtracting Polynomials

Learning Objectives:

- *Add polynomials horizontally.*
- *Write polynomial expressions for perimeter.*
- *Find the opposite of polynomials.*
- *Subtract polynomials horizontally.*
- *Write polynomial expressions for profit.*
- *Evaluate polynomial expressions.*

Standards:
A-APR: 1, F-BF: 1a

6.1.3 Multiplying Polynomials

Learning Objectives:

- *Multiply polynomials.*
- *Multiply special cases of polynomials.*

Standards:
A-SSE: 1, A-SSE: 2, A-APR: 1, A-CED: 2, F-BF: 1a, F-BF: 1b

6.1.4 Factoring Polynomials

Learning Objectives:

- *Use various methods to factor polynomials.*

Standards:
A-SSE: 2, A-APR: 1

6.1.5 Dividing Polynomials

Learning Objectives:

• *Divide polynomials by monomials and by binomials.*
• *Perform long division of polynomials.*

Standards:
A-SSE: 2, A-APR: 6, A-APR: 7

6.1.6 Synthetic Division and the Remainder and Factor Theorems

Learning Objectives:

• *Use synthetic division to divide polynomials.*
• *Use the Remainder and Factor Theorems.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-APR: 1, A-APR: 2, A-APR: 6, A-CED: 2, F-BF: 1b

6.2 Roots and Graphs of Polynomial Functions

6.2.1 Finding Real Roots of Polynomial Equations

Learning Objectives:

• *Use factoring to solve polynomial equations.*
• *Identify the multiplicity of roots.*
• *Use the Rational Root Theorem and the Irrational Root Theorem to solve polynomial equations.*

Standards:
A-SSE: 1.a, A-SSE: 2, A-SSE: 3.a, A-APR: 1, F-BF: 1a

6.2.2 Fundamental Theorem of Algebra

Learning Objectives:

• *Use the Fundamental Theorem of Algebra and its corollary to write a polynomial equation of least degree with given roots.*
• *Identify all of the roots of a polynomial equation.*

Standards:
A-SSE: 1.a, A-SSE: 2, A-SSE: 3.a, A-APR: 1, CN.C.7, CN.C.8, CN.C.9

6.2.3 Investigating Graphs of Polynomial Functions

Learning Objectives:

• *Use properties of end behavior to analyze, describe, and graph polynomial functions.*
• *Identify and use maxima and minima of polynomial functions to solve problems.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-APR: 3, A-CED: 2, F-IF: 2, F-IF: 7, F-IF: 7c, F-IF: 8, F-BF: 3

6.2.4 Transforming Polynomial Functions

Learning Objectives:

• Transform polynomial functions.
• Write and describe transformations of polynomial functions.

Standards:

A-SSE: 1, A-SSE: 1.a, A-CED: 2, F-IF: 2, F-IF: 7, F-IF: 7c, F-BF: 1b, F-BF: 3, G-CO: 2

6.2.5 Curve Fitting with Polynomial Models

Learning Objectives:

• Use finite differences to determine the degree of a polynomial that will fit a given set of data.
• Use technology to find polynomial models for a given set of data.

Standards:

F-IF: 4, F-BF: 1, F-BF: 1a, S-ID: 6a

7 Exponential and Logarithmic Functions

7.1 Exponential Functions and Logarithms

7.1.1 Exponential Functions, Growth, and Decay

Learning Objectives:

• *Write, evaluate, and graph exponential functions to model growth and decay situations.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-CED: 2, F-IF: 2, F-IF: 4, F-IF: 7, F-IF: 7e, F-BF: 1, F-BF: 1a, F-LE: 1c, F-LE: 2, Q.A.2

7.1.2 Inverses of Relations and Functions

Learning Objectives:

• *Graph and recognize inverses of relations and functions.*
• *Find inverses of functions.*

Standards:
A-CED: 2, F-IF: 2, F-IF: 5, F-IF: 7, F-BF: 1, F-BF: 4, F-BF: 4a, F-BF: 4c

7.1.3 Logarithmic Functions

Learning Objectives:

• *Write, evaluate, and graph logarithmic functions.*

Standards:
A-CED: 2, F-IF: 1, F-IF: 7, F-IF: 7e

7.1.4 Properties of Logarithms

Learning Objectives:

• *Use properties to simplify logarithmic expressions.*
• *Translate between logarithms in any base.*

Standards:
A-SSE: 2

7.2 Applying Exponential and Logarithmic Functions

7.2.1 Exponential and Logarithmic Equations and Inequalities

Learning Objectives:

• *Solve exponential and logarithmic equations and inequalities.*
• *Solve problems involving exponential decay and logarithmic equations.*

Standards:
A-SSE: 1, A-SSE: 2, A-CED: 2, A-CED: 3, F-IF: 7, F-IF: 7e, F-BF: 5, F-LE: 4

7.2.2 The Natural Base, *e*

Learning Objectives:

• Use the number e to write and graph exponential functions representing real-world situations.
• Solve equations and problems involving e or natural logarithms.

Standards:
A-SSE: 2, F-IF: 2, F-IF: 7, F-IF: 7e, F-BF: 1a, F-BF: 5, F-LE: 2, F-LE: 4

7.2.3 Transforming Exponential and Logarithmic Functions

Learning Objectives:

• Transform exponential and logarithmic functions by changing parameters.
• Describe the effects of changes in the coefficients of exponential and logarithmic functions.

Standards:
A-SSE: 1, A-SSE: 1.a, A-CED: 2, F-IF: 2, F-IF: 7, F-IF: 7e, F-BF: 3, F-BF: 5, G-CO: 2

7.2.4 Curve Fitting With Exponential and Logarithmic Models

Learning Objectives:

• Model data by using exponential and logarithmic functions.
• Use exponential and logarithmic models to analyze and predict.

Standards:
F-IF: 4, F-BF: 1, F-BF: 1a, F-LE: 1a, F-LE: 1c, F-LE: 2, S-ID: 6a

8 Rational and Radical Functions

8.1 Rational Functions

8.1.1 Variation Functions

Learning Objectives:

• *Solve problems involving direct, inverse, joint, and combined variation.*
• *Write, graph, and evaluate variation functions.*

Standards:
A-CED: 2, F-IF: 7, F-BF: 1, F-BF: 1a

8.1.2 Multiplying and Dividing Rational Expressions

Learning Objectives:

• *Simplify rational expressions.*
• *Multiply and divide rational expressions.*
• *Solve simple rational equations.*

Standards:
A-SSE: 1.a, A-SSE: 2, A-APR: 1, A-APR: 7

8.1.3 Adding and Subtracting Rational Expressions

Learning Objectives:

• *Find the least common multiple of polynomials.*
• *Add and subtract rational expressions.*
• *Simplify complex fractions.*

Standards:
A-SSE: 2, A-APR: 1, A-APR: 7, F-BF: 1a

8.1.4 Rational Functions

Learning Objectives:

• *Graph rational functions.*
• *Transform rational functions by changing parameters.*
• *Determine properties of hyperbolas.*

Standards:
A-SSE: 1.a, A-SSE: 2, A-SSE: 3.a, A-APR: 1, A-CED: 2, F-IF: 1, F-IF: 7, F-IF: 7d, F-IF: 8, F-BF: 3

8.1.5 Solving Rational Equations and Inequalities

Learning Objectives:

• *Solve rational equations and inequalities.*

Standards:
A-SSE: 2, A-APR: 7, A-REI: 2, F-BF: 1a, Q.A.2

8.2 Radical Functions

8.2.1 Radical Expressions and Rational Exponents

Learning Objectives:

• Rewrite radical expressions by using rational exponents.
• Simplify and evaluate radical expressions and expressions containing rational exponents.

Standards:
RN.A.1, RN.A.2

8.2.2 Radical Functions

Learning Objectives:

• Graph radical functions and inequalities.
• Transform radical functions by changing parameters.

Standards:
A-SSE: 1, A-SSE: 1.a, A-CED: 2, F-IF: 1, F-IF: 2, F-IF: 5, F-IF: 7, F-IF: 7b, F-BF: 3

8.2.3 Solving Radical Equations and Inequalities

Learning Objectives:

• Solve radical equations and inequalities.

Standards:
A-REI: 2

9 Properties and Attributes of Functions

9.1 Functions and Their Graphs

9.1.1 Multiple Representations of Functions

Learning Objectives:

• *Translate between the various representations of functions.*
• *Solve problems by using the various representations of functions.*

Standards:
A-SSE: 1, A-SSE: 1.a, A-CED: 2, F-IF: 4, F-BF: 1, F-BF: 1a, F-LE: 2, Q.A.2

9.1.2 Piecewise Functions

Learning Objectives:

• *Write, graph, and evaluate piecewise functions.*
• *Use piecewise functions to describe real-world situations.*

Standards:
A-SSE: 1, A-CED: 2, F-IF: 4, F-IF: 7, F-IF: 7b, F-BF: 1, F-BF: 1a, F-LE: 2, Q.A.2

9.1.3 Transforming Functions

Learning Objectives:

• *Transform functions.*
• *Recognize transformations of functions.*

Standards:
A-SSE: 1.a, A-CED: 2, F-IF: 7, F-IF: 7b, F-BF: 1, F-BF: 1a, F-BF: 3, F-LE: 2, G-CO: 2

9.2 Functional Relationships

9.2.1 Operations with Functions

Learning Objectives:

• *Add, subtract, multiply, and divide functions.*
• *Evaluate and write composite functions.*

Standards:
A-SSE: 1, A-APR: 1, A-CED: 2, F-IF: 1, F-BF: 1, F-BF: 1a, F-BF: 1c, F-LE: 2, Q.A.2

9.2.2 Functions and Their Inverses

Learning Objectives:

• *Determine whether the inverse of a function is a function.*
• *Write rules for the inverses of functions.*

Standards:
F-IF: 1, F-BF: 4, F-BF: 4a, F-BF: 4b

9.2.3 Modeling Real-World Data

Learning Objectives:

• *Apply functions to problem situations.*
• *Use mathematical models to make predictions.*

Standards:

A-SSE: 1, A-SSE: 1.a, A-CED: 2, F-IF: 4, F-BF: 1, F-BF: 1a, F-LE: 1, F-LE: 1a, F-LE: 1b, F-LE: 2, F-LE: 5