

# geo metry

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## Content, Standards & Objectives

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

Although Thinkwell's Geometry 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:*

<i>Topic's number and title</i>	→	<b>7.1.3 Triangle Similarity: AA, SSS, and SAS</b>
		<b>Learning Objectives:</b>
<i>Topic's learning objectives</i>	→	<ul style="list-style-type: none"><li>• Prove certain triangles are similar by using AA, SSS, and SAS.</li><li>• Use triangle similarity to solve problems.</li></ul>
		<b>Standards:</b>
<i>Topic's related standards from the Common Core State Standards for Mathematics</i>	→	G-SRT: 2, G-SRT: 3, G-SRT: 4, G-SRT: 5

We suggest keeping this document handy. Please let us know if you have any questions about the content here. Email us at [support@thinkwell.com](mailto:support@thinkwell.com).



## Homeschool Algebra Review

### AR.1 Solving Equations and Inequalities

#### AR.1.1 Simplifying Expressions

**Learning Objectives:**

- Use the Distributive Property with mental math.
- Combine like terms to simplify algebraic expressions.
- Use properties to justify simplification steps.

**Standards:**

A-SSE: 3, A-APR: 1

#### AR.1.2 Writing and Solving Two-Step Equations

**Learning Objectives:**

- Solve two-step equations.
- Write two-step equations.
- Solve equations that contain fractions.

**Standards:**

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

#### AR.1.3 Solving Two-Step Inequalities

**Learning Objectives:**

- Solve two-step inequalities.

**Standards:**

A-CED: 3, A-REI: 3, Q.A.2

#### AR.1.4 Writing and Solving Multi-Step Equations

**Learning Objectives:**

- Solve multi-step equations by combining like terms.
- Solve multi-step equations using the Distributive Property.

**Standards:**

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

#### AR.1.5 Solving Equations with Variables on Both Sides

**Learning Objectives:**

- Solve equations with variables on both sides.
- Identify identities and contradictions.
- Write and solve equations with variables on both sides.

**Standards:**

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

### AR.1.6 Systems of Equations

#### Learning Objectives:

- Solve systems of equations.

#### Standards:

A-REI: 5, A-REI: 6, A-REI: 11, F-LE: 2

### AR.2 Graphing and the Coordinate Plane

#### AR.2.1 The Coordinate Plane

##### Learning Objectives:

- Identify quadrants on a coordinate plane.
- Plot and identify points on a coordinate plane.

#### AR.2.2 Equations, Tables, and Graphs

##### Learning Objectives:

- Generate different representations of the same data.

##### Standards:

A-CED: 2, A-REI: 10, F-IF: 7, F-BF: 1, F-LE: 1b, F-LE: 2

#### AR.2.3 Graphing Using Intercepts

##### Learning Objectives:

- Use intercepts to graph linear equations.

##### Standards:

A-SSE: 1, A-SSE: 1.a, A-CED: 2, F-IF: 2, F-IF: 4, F-IF: 7, F-IF: 7a

### AR.3 Ratio and Proportion

#### AR.3.1 Rates, Ratios, and Proportions

##### Learning Objectives:

- Write and solve proportions.
- Find unit rates.
- Convert rates.
- Convert units using proportions.

##### Standards:

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

#### AR.3.2 Applications of Proportions

##### Learning Objectives:

- Write and solve proportions to find unknown measures in similar figures.
- Determine the effects on area, perimeter, and volume when the dimensions of a figure are changed.

##### Standards:

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



### AR.3.3 Finding and Using Percents

#### Learning Objectives:

- Learn to find percents and to find a number when a percent is known.

#### Standards:

F-BF: 1a

### AR.4 Operations with Polynomials and Factoring

#### AR.4.1 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

#### AR.4.2 Multiplying and Dividing Monomials

##### Learning Objectives:

- Divide polynomials by monomials and by binomials.
- Perform long division of polynomials.

##### Standards:

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

#### AR.4.3 Multiplying Monomials by Polynomials

##### Learning Objectives:

- Multiply monomials.
- Multiply polynomials by monomials.
- Write polynomial expressions for the volume of rectangular solids.

##### Standards:

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

#### AR.4.4 Multiplying Binomials

##### Learning Objectives:

- Multiply two binomials.
- Write polynomial expressions to represent lengths and areas.
- Find special products of binomials.

##### Standards:

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

#### AR.4.5 Factoring with the GCF

##### Learning Objectives:

- Factor polynomials by using the GCF and by grouping.
- Factor out a common binomial factor from polynomials.

##### Standards:

A-SSE: 2, A-APR: 1

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### AR.4.6 Factoring $x^2 + bx + c$

#### Learning Objectives:

- Factor trinomials by guess and check.
- Factor  $x^2 + bx + c$  when  $c$  is positive.
- Factor  $x^2 + bx + c$  when  $c$  is negative.

#### Standards:

A-SSE: 2, A-APR: 1

### AR.4.7 Factoring $ax^2 + bx + c$

#### Learning Objectives:

- Factor  $ax^2 + bx + c$  by guess and check.
- Factor  $ax^2 + bx + c$  when  $c$  is positive.
- Factor  $ax^2 + bx + c$  when  $c$  is negative.
- Factor  $ax^2 + bx + c$  when  $a$  is negative.

#### Standards:

A-SSE: 2, A-APR: 1

## AR.5 Radicals and Solving Quadratics

### AR.5.1 Radical Expressions

#### Learning Objectives:

- Simplify square-root expressions.
- Use the Product and Quotient Properties of Square Roots.
- Use the Pythagorean Theorem to estimate distances.

#### Standards:

A-SSE: 1, F-BF: 1a

### AR.5.2 Solving Quadratic Equations by Factoring

#### Learning Objectives:

- Use the Zero Product Property to solve quadratic equations.
- Solve quadratic equations by factoring.

#### Standards:

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

### AR.5.3 Solving Quadratic Equations by Using Square Roots

#### Learning Objectives:

- Use square roots to solve  $x^2 = c$ .
- Use square roots to solve quadratic equations.
- Approximate solutions to quadratic equations using a calculator.

#### Standards:

A-REI: 4, A-REI: 4b, F-BF: 1a



## 1 Fundamentals of Geometry

### 1.1 Points, Lines, Planes, and Angles

#### 1.1.1 Understanding Points, Lines, and Planes

**Learning Objectives:**

- Identify, name, and draw points, lines, segments, rays, and planes.
- Apply basic facts about points, lines, and planes.

**Standards:**

G-CO: 1

#### 1.1.2 Measuring and Constructing Segments

**Learning Objectives:**

- Use length and midpoint of a segment.
- Construct midpoints and congruent segments.

**Standards:**

F-BF: 1a, G-CO: 1, G-CO: 12

#### 1.1.3 Measuring and Constructing Angles

**Learning Objectives:**

- Name and classify angles.
- Measure and construct angles and angle bisectors.

**Standards:**

F-BF: 1a, G-CO: 1, G-CO: 12

#### 1.1.4 Pairs of Angles

**Learning Objectives:**

- Identify adjacent, vertical, complementary, and supplementary angles.
- Find measures of pairs of angles.

**Standards:**

F-BF: 1a

### 1.2 Coordinate and Transformation Tools

#### 1.2.1 Using Formulas in Geometry

**Learning Objectives:**

- Apply formulas for perimeter, area, and circumference.

**Standards:**

A-CED: 1, Q.A.1



### 1.2.2 Midpoint and Distance in the Coordinate Plane

#### Learning Objectives:

- *Develop and apply the formula for midpoint.*
- *Use the Distance Formula and the Pythagorean Theorem to find the distance between two points.*

#### Standards:

G-CO: 1, G-GPE: 6

### 1.2.3 Transformations in the Coordinate Plane

#### Learning Objectives:

- *Identify reflections, rotations, and translations.*
- *Graph transformations in the coordinate plane.*

#### Standards:

A-SSE: 1, A-SSE: 1.a, F-BF: 1a, G-CO: 2, G-CO: 4, G-CO: 5





## 2 Reasoning and Writing Geometric Proofs

### 2.1 Inductive and Deductive Reasoning

#### 2.1.1 Using Inductive Reasoning to Make Conjectures

**Learning Objectives:**

- Use inductive reasoning to identify patterns and make conjectures.
- Find counterexamples to disprove conjectures.

#### 2.1.2 Conditional Statements

**Learning Objectives:**

- Identify, write, and analyze the truth value of conditional statements.
- Write the inverse, converse, and contrapositive of a conditional statement.

**Standards:**

A-SSE: 1.a

#### 2.1.3 Using Deductive Reasoning to Verify Conjectures

**Learning Objectives:**

- Apply the Law of Detachment and the Law of Syllogism in logical reasoning.

#### 2.1.4 Biconditional Statements and Definitions

**Learning Objectives:**

- Write and analyze biconditional statements.

### 2.2 Mathematical Proof

#### 2.2.1 Algebraic Proof

**Learning Objectives:**

- Review properties of equality and use them to write algebraic proofs.
- Identify properties of equality and congruence.

**Standards:**

A-REI: 1

#### 2.2.2 Geometric Proof

**Learning Objectives:**

- Write two-column proofs.
- Prove geometric theorems by using deductive reasoning.

**Standards:**

G-CO: 9

#### 2.2.3 Flowchart and Paragraph Proofs

**Learning Objectives:**

- Write flowchart and paragraph proofs.
- Prove geometric theorems by using deductive reasoning.

**Standards:**

G-CO: 9

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## 3 Parallel and Perpendicular Lines

### 3.1 Lines with Transversals

#### 3.1.1 Planes, Lines, and Angles

**Learning Objectives:**

- Identify parallel, perpendicular, and skew lines.
- Identify the angles formed by two lines and a transversal.

**Standards:**

G-CO: 1

#### 3.1.2 Angles, Parallel Lines, and Transversals

**Learning Objectives:**

- Prove and use theorems about the angles formed by parallel lines and a transversal.

**Standards:**

F-BF: 1a, G-CO: 1

#### 3.1.3 Proving that Lines are Parallel

**Learning Objectives:**

- Use the angles formed by a transversal to prove two lines are parallel.

**Standards:**

F-BF: 1a, G-CO: 1, G-CO: 9

#### 3.1.4 Properties of Perpendicular Lines

**Learning Objectives:**

- Prove and apply theorems about perpendicular lines.

**Standards:**

G-CO: 1, G-CO: 9

### 3.2 Slope and the Equation of a Line

#### 3.2.1 Finding the Slope Given Two Points

**Learning Objectives:**

- Learn to find slope by using the slope formula.

**Standards:**

F-IF: 4, F-IF: 6, F-LE: 1b

#### 3.2.2 Slope-Intercept Form

**Learning Objectives:**

- Write a linear equation in slope-intercept form.
- Graph a line using slope-intercept form.

**Standards:**

A-SSE: 1, A-SSE: 1.a, F-IF: 4, F-IF: 6, F-IF: 7, F-IF: 8,  
F-BF: 1, F-BF: 1a, F-LE: 1b, F-LE: 2, F-LE: 5, Q.A.2

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### 3.2.3 Point-Slope Form

**Learning Objectives:**

- Graph a line and write a linear equation using point-slope form.
- Write a linear equation given two points.

**Standards:**

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

### 3.2.4 Slopes of Parallel and Perpendicular Lines

**Learning Objectives:**

- Identify and graph parallel and perpendicular lines.
- Write equations to describe lines parallel or perpendicular to a given line.

**Standards:**

A-SSE: 1.a, G-CO: 1, G-GPE: 5



## 4 Triangle Congruence

### 4.1 Triangles and Congruence

#### 4.1.1 Classifying Triangles

**Learning Objectives:**

- Classify triangles by their angle measures and side lengths.
- Use triangle classifications to find angle measures and side lengths.

**Standards:**

F-BF: 1a

#### 4.1.2 Angle Relationships in Triangles

**Learning Objectives:**

- Find the measure of interior and exterior angles of triangles.
- Apply theorems about the interior and exterior angles of triangles.

**Standards:**

F-BF: 1a

#### 4.1.3 Congruent Triangles

**Learning Objectives:**

- Use properties of congruent triangles.
- Prove triangles congruent by using the definition of congruence.

**Standards:**

G-CO: 7, G-CO: 10, G-SRT: 5

### 4.2 Proving Triangle Congruence

#### 4.2.1 Triangle Congruence: SSS and SAS

**Learning Objectives:**

- Apply SSS and SAS to construct triangles and to solve problems.
- Prove triangles congruent by using SSS and SAS.

**Standards:**

F-BF: 1a, G-CO: 7, G-CO: 8, G-CO: 10, G-SRT: 5

#### 4.2.2 Triangle Congruence: ASA, AAS, and HL

**Learning Objectives:**

- Apply ASA, AAS, and HL to construct triangles and to solve problems.
- Prove triangles congruent by using ASA, AAS, and HL.

**Standards:**

G-CO: 7, G-CO: 8, G-CO: 10, G-SRT: 5



### 4.2.3 Triangle Congruence: CPCTC

#### Learning Objectives:

- Using CPCTC to prove parts of triangles are congruent.

#### Standards:

G-CO: 7, G-CO: 8, G-CO: 10, G-SRT: 5

### 4.2.4 Introduction to Coordinate Proof

#### Learning Objectives:

- Position figures in the coordinate plane for use in coordinate proofs.
- Prove geometric concepts by using coordinate proof.

#### Standards:

G-CO: 8, G-CO: 10, G-SRT: 5, G-GPE: 4

### 4.2.5 Isosceles and Equilateral Triangles

#### Learning Objectives:

- Prove theorems about isosceles and equilateral triangles.
- Apply properties of isosceles and equilateral triangles.

#### Standards:

F-BF: 1a, G-CO: 10, G-SRT: 5, G-GPE: 4



## 5 Properties and Attributes of Triangles

### 5.1 Segments in Triangles

#### 5.1.1 Perpendicular and Angle Bisector Theorems

**Learning Objectives:**

- Prove and apply theorems about perpendicular bisectors.
- Prove and apply theorems about angle bisectors.

**Standards:**

F-BF: 1a, G-GPE: 5

#### 5.1.2 Medians, Altitudes, and Midsegments in Triangles

**Learning Objectives:**

- Apply properties of medians, altitudes, and midsegments of a triangle.

**Standards:**

F-BF: 1a, G-GPE: 5

### 5.2 Relationships in Triangles

#### 5.2.1 Indirect Proof and Inequalities in One Triangle

**Learning Objectives:**

- Write indirect proofs.
- Apply inequalities in one triangle.

**Standards:**

A-CED: 3, G-CO: 10

#### 5.2.2 Inequalities in Two Triangles

**Learning Objectives:**

- Apply inequalities in two triangles.

**Standards:**

A-CED: 3

#### 5.2.3 The Pythagorean Theorem

**Learning Objectives:**

- Use the Pythagorean Theorem and its converse to solve problems.
- Use Pythagorean inequalities to classify triangles.

**Standards:**

F-BF: 1a

#### 5.2.4 Applying Special Right Triangles

**Learning Objectives:**

- Justify and apply properties of  $45^\circ$ - $45^\circ$ - $90^\circ$  triangles.
- Justify and apply properties of  $30^\circ$ - $60^\circ$ - $90^\circ$  triangles.

**Standards:**

F-BF: 1a

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## 6 Polygons and Quadrilaterals

### 6.1 Polygons and Parallelograms

#### 6.1.1 Properties and Attributes of Polygons

**Learning Objectives:**

- Classify polygons based on their sides and angles.
- Find and use the measures of interior and exterior angles of polygons.

**Standards:**

F-BF: 1a

#### 6.1.2 Properties of Parallelograms

**Learning Objectives:**

- Prove and apply properties of parallelograms.
- Use properties of parallelograms to solve problems.

**Standards:**

F-BF: 1a, G-SRT: 5

#### 6.1.3 Conditions for Parallelograms

**Learning Objectives:**

- Prove that a given quadrilateral is a parallelogram.

**Standards:**

G-CO: 11

### 6.2 Other Special Quadrilaterals

#### 6.2.1 Properties of Special Parallelograms

**Learning Objectives:**

- Prove and apply properties of rectangles, rhombuses, and squares.
- Use properties of rectangles, rhombuses, and squares to solve problems.

**Standards:**

F-BF: 1a, G-CO: 11

#### 6.2.2 Conditions for Special Parallelograms

**Learning Objectives:**

- Prove that a given quadrilateral is a rectangle, rhombus, or square.

**Standards:**

G-CO: 11, G-SRT: 5

#### 6.2.3 Properties of Kites and Trapezoids

**Learning Objectives:**

- Use properties of kites to solve problems.
- Use properties of trapezoids to solve problems.

**Standards:**

F-BF: 1a

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## 7 Similarity

### 7.1 Similarity Relationships

#### 7.1.1 Ratio and Proportion

**Learning Objectives:**

- Write and simplify ratios.
- Use proportions to solve problems.

**Standards:**

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

#### 7.1.2 Ratios in Similar Polygons

**Learning Objectives:**

- Identify similar polygons.
- Apply properties of similar polygons to solve problems.

**Standards:**

F-BF: 1a, G-SRT: 2

#### 7.1.3 Triangle Similarity: AA, SSS, and SAS

**Learning Objectives:**

- Prove certain triangles are similar by using AA, SSS, and SAS.
- Use triangle similarity to solve problems.

**Standards:**

G-SRT: 2, G-SRT: 3, G-SRT: 4, G-SRT: 5





## 8 Right Triangles and Trigonometry

### 8.1 Trigonometric Ratios

#### 8.1.1 Similarity in Right Triangles

**Learning Objectives:**

- Use geometric mean to find segment lengths in right triangles.
- Apply similarity relationships in right triangles to solve problems.

**Standards:**

F-BF: 1a, G-SRT: 3, G-SRT: 4, G-SRT: 5

#### 8.1.2 Trigonometric Ratios

**Learning Objectives:**

- Find the sine, cosine, and tangent of an acute angle.
- Use trigonometric ratios to find side lengths in right triangles and to solve real-world problems.

**Standards:**

F-BF: 1a, G-SRT: 6

#### 8.1.3 Solving Right Triangles

**Learning Objectives:**

- Use trigonometric ratios to find angle measures in right triangles and to solve real-world problems.

**Standards:**

F-BF: 1a, G-SRT: 6, G-SRT: 8, G-MG: 1



## 9 Extending Perimeter, Circumference, and Area

### 9.1 Developing Geometric Formulas

#### 9.1.1 Developing Formulas for Triangles and Quadrilaterals

**Learning Objectives:**

- *Develop and apply the formulas for the areas of triangles and special quadrilaterals.*
- *Solve problems involving perimeters and areas of triangles and special quadrilaterals.*

**Standards:**

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

#### 9.1.2 Developing Formulas for Circles and Regular Polygons

**Learning Objectives:**

- *Develop and apply the formulas for the area and circumference of a circle.*
- *Develop and apply the formula for the area of a regular polygon.*

**Standards:**

G-CO: 1, Q.A.1, Q.A.2

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## 10 Spatial Reasoning

### 10.1 Surface Area and Volume

#### 10.1.1 Surface Area of Prisms and Cylinders

**Learning Objectives:**

- Learn and apply the formula for the surface area of a prism.
- Learn and apply the formula for the surface area of a cylinder.

**Standards:**

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

#### 10.1.2 Surface Area of Pyramids and Cones

**Learning Objectives:**

- Learn and apply the formula for the surface area of a pyramid.
- Learn and apply the formula for the surface area of a cone.

**Standards:**

F-BF: 1a, Q.A.1, Q.A.3

#### 10.1.3 Volume of Prisms and Cylinders

**Learning Objectives:**

- Learn and apply the formula for the volume of a prism.
- Learn and apply the formula for the volume of a cylinder.

**Standards:**

F-BF: 1a, G-GMD: 3, Q.A.1

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## 11 Circles

### 11.1 Lines and Arcs in Circles

#### 11.1.1 Lines That Intersect Circles

**Learning Objectives:**

- Identify tangents, secants, and chords.
- Use properties of tangents to solve problems.

**Standards:**

F-BF: 1a, G-CO: 1, G-C: 2, G-C: 4

#### 11.1.2 Arcs and Chords

**Learning Objectives:**

- Apply properties of arcs.
- Apply properties of chords.

**Standards:**

F-BF: 1a, G-CO: 1, G-C: 2, G-C: 3

### 11.2 Angles and Segments in Circles

#### 11.2.1 Inscribed Angles

**Learning Objectives:**

- Find the measure of an inscribed angle.
- Use inscribed angles and their properties to solve problems.

**Standards:**

F-BF: 1a, G-CO: 1, G-C: 2, G-C: 3

#### 11.2.2 Angle Relationships in Circles

**Learning Objectives:**

- Find the measures of angles formed by lines that intersect circles.
- Use angle measures to solve problems.

**Standards:**

F-BF: 1a, G-CO: 1, G-C: 2, G-C: 4

#### 11.2.3 Segment Relationships in Circles

**Learning Objectives:**

- Find the lengths of segments formed by lines that intersect circles.
- Use the lengths of segments in circles to solve problems.

**Standards:**

F-BF: 1a, G-CO: 1, G-C: 2, G-C: 4



## 12 Transformational Geometry

### 12.1 Congruence Transformations

#### 12.1.1 Reflections

**Learning Objectives:**

- *Identify and draw reflections.*

**Standards:**

G-CO: 2, G-CO: 4, G-CO: 5, G-CO: 6

#### 12.1.2 Translations

**Learning Objectives:**

- *Identify and draw translations.*

**Standards:**

G-CO: 2, G-CO: 4, G-CO: 5, G-CO: 6

#### 12.1.3 Rotations

**Learning Objectives:**

- *Identify and draw rotations.*

**Standards:**

G-CO: 2, G-CO: 4, G-CO: 5, G-CO: 6