STUDYWALKS · COURSE SYLLABUS

Geometry — High School Course

Geometry is the high school course that usually comes after Algebra 1. It starts with points, lines, angles and the language of proof, then works through parallel lines, constructions described in words, rigid transformations and congruence, triangle facts and congruence proofs, quadrilaterals, dilations and similarity, right triangles and trigonometry, coordinate geometry, circles, arc length and radians, equations of circles, area, and the surface area and volume of solids, and ends with modeling. Its figures are drawn from the course's own checked coordinates, and the narration states every given, so a lesson can still be followed by ear. Its scope is modeled on the high school Geometry course described in the Common Core State Standards for Mathematics (Appendix A). It has its own StudyWalks final exam, and the homeschool parent grants the high school credit. Start with Algebra 1 if you have not taken first-year algebra.

CREDIT LABEL	HOURS GOAL	STUDYWALKS LEARNING HOURS	SUGGESTED OFFLINE HOURS
1.0 credit	**120 h**	**35 h**	**85 h**
high school, with the study plan	the 1.0-credit convention	measured runtime plus assessment time	working problems and review

35 h StudyWalks (9.5 h of lessons, 16.6 h of lectures, 9.1 h of quizzes and exams) + **85 h** suggested offline study = **120 h**. 588 lessons in 27 units.

High school credit is granted by the homeschool parent under the state's rules. StudyWalks supplies the record: hours, scores and this syllabus. The credit label is a suggestion; the parent makes the final call.

Course contents

Unit	Title and lecture topics	Lessons	Lecture
1	**Getting Started: Points, Lines, Planes and Geometry's Language** How the course works · Points, lines and planes · Words and reasons · Length on a number line · Midpoints, circles and one problem	19	29 min
2	**Angles, Angle Pairs and Measuring** Angles and their measure · Adding and bisecting angles · Angle pairs · Equations from angle relationships	21	38 min
3	**Reasoning and Proof: Conditionals, Properties, Two-Column and Paragraph Proofs** Patterns and conditionals · Deduction and properties · Postulates and two-column proofs · Paragraph proofs and checking a proof	21	35 min
4	**Parallel Lines, Transversals and Perpendicular Lines** Lines that never meet · Angle pairs at parallel lines · Finding and proving angles · Proving lines parallel · Perpendicular lines and distance · The parallel postulate and helper lines · Parallel lines in words and in the world	22	43 min (2 parts)

Unit	Title and lecture topics	Lessons	Lecture
5	**Constructions Described in Words** The tools and the rules · Carrying a length · Cutting in half · Copying angles and perpendiculars · Perpendicular and parallel lines · Squares and hexagons · Checking by reasons	22	41 min (2 parts)
6	**Rigid Transformations: Translations, Reflections and Rotations** Transformations and translations · Reflections · Rotations and what moves keep · Finding, describing and undoing moves	22	34 min
7	**Symmetry, Sequences of Transformations and Congruence** Symmetry · Sequences of transformations · Congruence by rigid motions · Using and checking congruence	20	34 min
8	**Triangle Facts: Angle Sums, Exterior Angles, Isosceles Triangles, Triangle Inequality** Classifying triangles and the angle sum · Exterior angles · Isosceles and equilateral triangles · Sides, angles and the triangle inequality	23	36 min
9	**Triangle Congruence: SSS, SAS, ASA, AAS and HL** Included parts and SAS · ASA and SSS · AAS, and two patterns that fail · HL and free pairs · Choosing a rule · Plans, motions and coordinates · Congruence at work	24	44 min (2 parts)
10	**Proving Things with Congruent Triangles; Perpendicular and Angle Bisector Theorems** Corresponding parts in proofs · The perpendicular bisector theorem · The angle bisector theorem · Two-step proofs · Full proofs and proof habits	22	36 min
11	**Midsegments, Medians and the Centers of a Triangle** Midsegments · Medians and altitudes · The circumcenter and the incenter · Choosing centers, and centers on the grid	22	32 min
12	**Polygons and Quadrilaterals; Proving Parallelograms** Polygons and their angles · Parallelograms · Rhombuses, squares and diagonals · Trapezoids and kites · Sorting and proving	24	42 min (2 parts)
13	**Dilations and Scale Factor** What a dilation does · What a dilation keeps and changes · Other centers, scales and maps · Dilations at work	20	30 min
14	**Similar Figures and Triangle Similarity: AA, SAS and SSS** Similar figures · Ratios and proportions · Tests for similar triangles · Polygons, overlaps and perimeters · Measuring and proving with similarity · Similar or congruent, the grid, and the capstone	23	43 min (2 parts)
15	**Proportions in Triangles and the Pythagorean Theorem by Similarity** The side-splitter theorem · Parallel lines and angle bisectors · The altitude to the hypotenuse · The Pythagorean theorem · Proportions at work	20	36 min
16	**Right Triangles: Pythagorean Theorem, Converse, Special Right Triangles** Finding a missing side · The converse and classifying · Special right triangles · Special triangles in shapes · Distances, real lengths and rounding	23	36 min
17	**Trigonometric Ratios: Sine, Cosine and Tangent** Why ratios · Sine, cosine and tangent · Complements and exact ratios · Sizes of ratios, and finding sides · Slope, coordinates and the whole unit	22	36 min

Unit	Title and lecture topics	Lessons	Lecture
18	**Solving Right Triangles; Angles of Elevation and Depression** Inverse trig · Solving a right triangle · Elevation and depression · Word problems, ramps and rounding · Polygons, checks and the whole unit	21	36 min
19	**Coordinates: Distance, Midpoint and Dividing a Segment in a Ratio** Distance on the plane · Classifying and midpoints · Dividing a segment · Perimeter and equal distances · Proofs, exact answers and collinearity	22	36 min
20	**Slopes of Parallel and Perpendicular Lines; Coordinate Proofs; Perimeter and Area on a Grid** Slopes of parallel and perpendicular lines · Writing lines · Coordinate proof · Proof and area on a grid · Perpendiculars at work · Choosing tools, and the capstone	22	41 min (2 parts)
21	**Circles: Parts, Arcs, Central and Inscribed Angles** Parts, central angles and arcs · Inscribed angles · Chords · Circumference, and the capstone	23	35 min
22	**Circles: Tangents, Chords, Inscribed Quadrilaterals, Circles of a Triangle** Tangents and secants · Inscribed quadrilaterals · Circles of a triangle · The circles of a triangle, continued · Angles and polygons in circles · Touching circles, designs, and the capstone	23	40 min (2 parts)
23	**Arc Length, Sector Area and Radians** Arc length · Circle and sector area · Radians · Radians at work, and the capstone	21	35 min
24	**Equations of Circles** The equation of a circle · From points to equations, and back · Completing the square · Tangents, proofs and the capstone	20	35 min
25	**Area and Perimeter: Polygons, Circles, Composite Figures; Scaling Area** Area of rectangles, parallelograms and triangles · Trapezoids, rhombuses and kites · Regular polygons and circles · Composite figures · Perimeter and scaling area · Working back, and square units · Area at work, and the capstone	24	42 min (2 parts)
26	**Solids: Cross-Sections, Solids of Rotation, Surface Area and Volume** Solids and cross-sections · Solids of rotation · Volume of prisms and cylinders · Pyramids, cones and spheres · Surface area · Scaling and density · Composite solids and cubic units · Pyramids, cones and the capstone	27	45 min (2 parts)
27	**Modeling with Geometry and the Course in One Thread** The final, and modeling · Congruence, similarity and trigonometry in review · Coordinates and circles in review · Measurement, and the course in one thread	15	27 min

Assessment and grading

- **Unit quizzes.** 27 quizzes, 10 questions each, checked as the student goes, each answer with the lesson to review. Untimed; retakes are unlimited.
- **Mid exam.** 50 questions on units 1–13, drawn fresh each time and scored at the end with a breakdown by content area. Untimed; retakes are unlimited.
- **Final exam.** 48 questions, 90 minutes, on the whole course. Scored 20–80; 50 passes (32 of 48 correct, about 67%). Retakes are unlimited with a 24-hour wait, each a fresh draw.

Suggested composite grade

Part	Weight
Unit quizzes (average of best scores)	20%
Mid exam (best score)	20%
Final exam (percent correct)	60%

Suggested letter scale

Letter	Composite
A	90–100
B	80–89
C	70–79
D	60–69
F	below 60

Suggested; the parent sets the grade. A passing final is the completion standard for the course record.

Study plan

The 85 offline hours are spread over the units in proportion to each unit's StudyWalks time. For each unit: draw each lesson's figure by hand, do the constructions with a compass and straightedge, work the exercises in the matching sections of Africk's Elementary College Geometry (free online; this course never reproduces them), write out the unit's proofs, and rework the unit quiz misses by hand. Log the time as you go.

Unit	Title	StudyWalks	Offline, suggested	Unit total
1	Getting Started: Points, Lines, Planes and Geometry's Language	48 min	2 h 35 min	3 h 23 min
2	Angles, Angle Pairs and Measuring	58 min	3 h 10 min	4 h 8 min
3	Reasoning and Proof: Conditionals, Properties, Two-Column and Paragraph Proofs	56 min	3 h 5 min	4 h 1 min
4	Parallel Lines, Transversals and Perpendicular Lines	1 h 4 min	3 h 30 min	4 h 34 min
5	Constructions Described in Words	1 h 2 min	3 h 25 min	4 h 27 min
6	Rigid Transformations: Translations, Reflections and Rotations	55 min	3 h	3 h 55 min
Lessons and lectures		**26 h 3 min**	**85 h**	**111 h 3 min**
Quizzes, mid exam and final (stated time)		**9 h 6 min**	**—**	**9 h 6 min**

Unit	Title	StudyWalks	Offline, suggested	Unit total
7	Symmetry, Sequences of Transformations and Congruence	53 min	2 h 55 min	3 h 48 min
8	Triangle Facts: Angle Sums, Exterior Angles, Isosceles Triangles, Triangle Inequality	58 min	3 h 10 min	4 h 8 min
9	Triangle Congruence: SSS, SAS, ASA, AAS and HL	1 h 7 min	3 h 40 min	4 h 47 min
10	Proving Things with Congruent Triangles; Perpendicular and Angle Bisector Theorems	57 min	3 h 5 min	4 h 2 min
11	Midsegments, Medians and the Centers of a Triangle	53 min	2 h 55 min	3 h 48 min
12	Polygons and Quadrilaterals; Proving Parallelograms	1 h 5 min	3 h 30 min	4 h 35 min
13	Dilations and Scale Factor	49 min	2 h 40 min	3 h 29 min
14	Similar Figures and Triangle Similarity: AA, SAS and SSS	1 h 5 min	3 h 30 min	4 h 35 min
15	Proportions in Triangles and the Pythagorean Theorem by Similarity	55 min	3 h	3 h 55 min
16	Right Triangles: Pythagorean Theorem, Converse, Special Right Triangles	59 min	3 h 15 min	4 h 14 min
17	Trigonometric Ratios: Sine, Cosine and Tangent	57 min	3 h 5 min	4 h 2 min
18	Solving Right Triangles; Angles of Elevation and Depression	56 min	3 h 5 min	4 h 1 min
19	Coordinates: Distance, Midpoint and Dividing a Segment in a Ratio	57 min	3 h 5 min	4 h 2 min
20	Slopes of Parallel and Perpendicular Lines; Coordinate Proofs; Perimeter and Area on a Grid	1 h 2 min	3 h 20 min	4 h 22 min
21	Circles: Parts, Arcs, Central and Inscribed Angles	57 min	3 h 5 min	4 h 2 min
22	Circles: Tangents, Chords, Inscribed Quadrilaterals, Circles of a Triangle	1 h 2 min	3 h 20 min	4 h 22 min
23	Arc Length, Sector Area and Radians	56 min	3 h 5 min	4 h 1 min
24	Equations of Circles	54 min	2 h 55 min	3 h 49 min
25	Area and Perimeter: Polygons, Circles, Composite Figures; Scaling Area	1 h 5 min	3 h 30 min	4 h 35 min
26	Solids: Cross-Sections, Solids of Rotation, Surface Area and Volume	1 h 11 min	3 h 50 min	5 h 1 min
27	Modeling with Geometry and the Course in One Thread	42 min	2 h 15 min	2 h 57 min
Lessons and lectures		**26 h 3 min**	**85 h**	**111 h 3 min**
Quizzes, mid exam and final (stated time)		**9 h 6 min**	**—**	**9 h 6 min**

Unit times are the unit's lecture runtime plus its lessons at the course's measured average lesson length; totals can differ from the learning hours by rounding.

Sources

- **Anchor:** Illustrative Mathematics. *IM 9–12 Math Geometry* (student edition), © 2019. Topic order and definitions informed by this course; the Illustrative Mathematics name and logo are not covered by its licence. CC BY 4.0
- **Witness:** Henry Africk. *Elementary College Geometry*. CUNY New York City College of Technology (2021); LibreTexts edition. CC BY-NC-SA 4.0
- **Witness:** Donna Kirk and others. *Contemporary Mathematics*. OpenStax, Rice University (chapter 10, Geometry, and chapter 2, Logic). CC BY-NC-SA 4.0
- **Witness:** Euclid. *The First Six Books of the Elements*, edited by John Casey (1885). Project Gutenberg. Public domain
- **Witness:** Carl Stitz and Jeff Zeager. *Precalculus*, 4th edition (distance, midpoint, lines, circles, right-triangle trigonometry and radians). CC BY-NC-SA
- **Witness:** Tyler Wallace. *Beginning and Intermediate Algebra* (2010) (slopes and lines only). CC BY 3.0

This StudyWalks final is an end-of-course exam built from the Geometry course, whose scope is modeled on the high school Geometry course described in the Common Core State Standards for Mathematics (Appendix A). Scores are StudyWalks scores on a 20–80 scale. The course and exam have not been reviewed, certified or endorsed by any state, standards body or testing organization, and passing does not award credit: high school credit is granted by the homeschool parent.

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