STUDYPREP — MATH COURSES

FULL COURSE CURRICULUM

Algebra 2

A complete, standards-aligned Algebra 2 course covering polynomial and rational functions, radical expressions, exponential and logarithmic models, complex numbers, sequences, series, statistics, probability, and introductory trigonometry. Aligned to CCSS Algebra 2.

8	45	98
Units	Topics	Estimated days (~20 weeks)

Course Overview

Unit 1 — Polynomial Functions	6 topics · 14 days
Unit 2 — Rational Functions & Expressions	5 topics · 10 days
Unit 3 — Radical & Rational Exponent Functions	7 topics · 14 days
Unit 4 — Exponential & Logarithmic Functions	5 topics · 14 days
Unit 5 — Quadratics & Complex Numbers	5 topics · 10 days
Unit 6 — Sequences & Series	5 topics · 10 days
Unit 7 — Statistics & Probability	7 topics · 14 days
Unit 8 — Introduction to Trigonometry	5 topics · 12 days

Unit 1 — Polynomial Functions

14 days

TOPIC	DESCRIPTION
Polynomial Review & Operations	Adding, subtracting, multiplying polynomials; identifying degree, leading coefficient, and end behavior.
Polynomial Long Division & Synthetic Division	Dividing polynomials using long division and synthetic division; interpreting quotients and remainders.
Remainder & Factor Theorems	Using the Remainder Theorem to evaluate polynomials; Factor Theorem to identify roots and factors.
Zeros of Polynomial Functions	Rational Zero Theorem; finding all real zeros; multiplicity; relationship between zeros and x-intercepts.
Graphing Polynomial Functions	End behavior, turning points, zeros, multiplicity effects, and sketching graphs of higher-degree polynomials.
Fundamental Theorem of Algebra	Every non-constant polynomial has at least one complex root; a degree-n polynomial has exactly n roots counting multiplicity; relating to real vs. complex zeros.

Unit 2 — Rational Functions & Expressions

10 days

TOPIC	DESCRIPTION
Simplifying Rational Expressions	Factoring numerators and denominators; canceling common factors; identifying domain restrictions.
Multiplying & Dividing Rational Expressions	Multiplying and dividing by factoring first; simplifying complex fractions.
Adding & Subtracting Rational Expressions	Finding the LCD; rewriting fractions with common denominators; combining and simplifying.
Solving Rational Equations	Multiplying through by the LCD; solving linear and quadratic rational equations; checking for extraneous solutions.
Graphing Rational Functions	Vertical, horizontal, and slant asymptotes; holes; domain and range; sketching graphs.

Unit 3 — Radical & Rational Exponent Functions

14 days

TOPIC	DESCRIPTION
Simplifying Radical Expressions	Product and quotient rules for radicals; rationalizing denominators; simplifying nth roots.
Rational Exponents	Converting between radical and rational exponent notation; applying exponent rules.
Operations with Radicals	Adding, subtracting, multiplying, and dividing radical expressions; conjugates.
Solving Radical Equations	Isolating radicals; squaring both sides; checking for extraneous solutions; equations with two radicals.
Inverse Functions	Finding inverse functions algebraically and graphically; verifying inverses; restricting domains for invertibility.
Function Composition	Evaluating $f(g(x))$ and $g(f(x))$; domain of composed functions; decomposing composite functions; verifying inverse pairs.
Transformations of All Function Families	Applying vertical/horizontal shifts, stretches, compressions, and reflections to all function types; effect of a, h, k in $f(x) = a \cdot f(x - h) + k$.

Unit 4 — Exponential & Logarithmic Functions

14 days

TOPIC	DESCRIPTION
Exponential Functions & Growth/Decay	$f(x) = ab^x$ form; identifying growth vs. decay; graphing transformations; compound interest; half-life models.
Introduction to Logarithms	Logarithm definition as inverse of exponential; converting between logarithmic and exponential forms; evaluating logs.
Properties of Logarithms	Product, quotient, and power properties; expanding and condensing logarithmic expressions.
Solving Exponential & Logarithmic Equations	Using properties and change of base formula; solving by equating exponents or applying logs.
Exponential & Logarithmic Modeling	Population growth; exponential regression; natural logarithm (ln); continuous compounding with e.

Unit 5 — Quadratics & Complex Numbers

10 days

TOPIC	DESCRIPTION
Vertex Form & Transformations	$f(x) = a(x - h)^2 + k$; identifying vertex, axis of symmetry; graphing transformations of parabolas.
Complex Numbers	Imaginary unit i; standard form a + bi; adding, subtracting, multiplying, dividing, and simplifying complex numbers.
Quadratics with Complex Solutions	Discriminant analysis; solving quadratics with negative discriminants; expressing complex solutions in a + bi form.
Systems with Quadratics	Solving systems of linear and quadratic equations algebraically and graphically; intersection points as solutions.
Quadratic Inequalities	Solving quadratic inequalities by graphing parabolas and identifying solution regions; interval notation.

Unit 6 — Sequences & Series

10 days

TOPIC	DESCRIPTION
Arithmetic Sequences & Series	Common difference; nth term formula $a_n = a_1 + (n-1)d$; partial sums of arithmetic series.
Geometric Sequences & Series	Common ratio; nth term formula $a_n = a_1 r^{n-1}$; partial sums of geometric series.
Summation (Sigma) Notation	Reading and writing sigma notation; evaluating finite sums; computing series values with formulas.
Infinite Geometric Series	Convergence condition $\|r\| < 1$; sum formula $S = a_1/(1-r)$; real-world applications like repeating decimals.
Binomial Theorem	Pascal's Triangle; binomial coefficients C(n,k); expanding $(a + b)^n$; finding specific terms.

Unit 7 — Statistics & Probability

14 days

TOPIC	DESCRIPTION
Measures of Center & Spread	Mean, median, mode, range, IQR, standard deviation, variance; comparing distributions.
Normal Distribution & z-Scores	Properties of normal curves; empirical rule (68-95-99.7); computing and interpreting z-scores; percentiles.
Data Collection Methods	Surveys, observational studies, experiments; sampling types; identifying sources of bias; scope of inference.
Statistical Inferences & Margins of Error	Making inferences from sample data; confidence intervals; margin of error; interpreting poll results; simulation-based inference.
Counting Principle & Permutations	Multiplication principle; factorial notation; permutation formula P(n,r); permutations with repetition.
Combinations & Probability	Combination formula C(n,r); distinguishing permutations from combinations; theoretical and experimental probability.
Conditional Probability & Independence	P(A|B); multiplication rule; independent vs. dependent events; mutually exclusive events; Venn diagrams.

Unit 8 — Introduction to Trigonometry

12 days

TOPIC	DESCRIPTION
Right Triangle Trigonometry	SOH-CAH-TOA ratios; finding missing sides and angles; applications of right triangle trig.
Unit Circle & Angle Measure	Radian and degree conversion; standard position; reference angles; unit circle coordinates for key angles.
Trigonometric Functions	Definitions of sin, cos, tan (and reciprocals) from the unit circle; evaluating trig functions at special angles.
Graphing Sine & Cosine	Amplitude, period, phase shift, vertical shift; graphing y = a·sin(bx + c) + d and cosine equivalents.
Fundamental Trigonometric Identities	Pythagorean identities; reciprocal identities; quotient identities; using identities to simplify expressions.

Course Summary

UNIT	TOPICS	EST. DAYS
1. Polynomial Functions	6	14
2. Rational Functions & Expressions	5	10
3. Radical & Rational Exponent Functions	7	14
4. Exponential & Logarithmic Functions	5	14
5. Quadratics & Complex Numbers	5	10
6. Sequences & Series	5	10
7. Statistics & Probability	7	14
8. Introduction to Trigonometry	5	12
Total	**45**	**98**

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