

Scholars Math 9 is a full-year Algebra 2 curriculum for highly motivated students willing to face hard problems. The course covers a full honors intermediate algebra curriculum, plus many advanced problem-solving applications not found in a standard intermediate algebra class. Topics covered in the class include quadratic equations, conics, polynomials, functions, logarithms, clever factorizations and substitutions, systems of equations, sequences and series, symmetric sums, advanced factoring methods, classical inequalities, functional equations, and more.

Textbook(s):

Scholars Math 9 requires *Intermediate Algebra* by Richard Rusczyk and Mathew Crawford.

Sample Problems:

- ▶ If $a + ar + ar^2 + \dots = 15$ and $a + ar^2 + ar^4 + \dots = 10$, then what is the sum of the geometric series $a + ar^3 + ar^6 + \dots$?
- ▶ Show that if the roots of $x^3 + ax + b = 0$ are rational numbers m, n , and p , then the roots of $mx^2 + nx + p$ are also rational.
- ▶ Show that if a, b , and c are positive, then $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} \geq \frac{1}{a\sqrt{bc}} + \frac{1}{b\sqrt{ac}} + \frac{1}{c\sqrt{ab}}$.

Common Core State Standards (High School):

| Domain | Subdomain | Standards |
|---------------------|--|--------------------------|
| Number and Quantity | The Complex Number System | 7, 8, 9 |
| Algebra | Seeing Structure in Expressions | 1b, 3ab, 4 |
| | Arithmetic with Polynomials & Rational Expressions | 1, 2, 3, 4, 6, 7 |
| | Creating Equations | 2 |
| | Reasoning with Equations and Inequalities | 2, 4a, 5, 10, 11 |
| Functions | Interpreting Functions | 1, 3, 4, 5, 7bcde, 8b, 9 |
| | Building Functions | 1bc, 2, 3, 4abc, 5 |
| | Linear, Quadratic, & Exponential Models | 1abc, 2, 3, 4, 5 |
| Geometry | Expressing Geometric Properties with Equations | 2, 3 |

Time Commitment: 24 lessons, 1.5 in-class hours + 4–5 hours of homework per lesson.

Content:

| Lesson | Scholars Topic |
|--------|--|
| 1 | Review and Overview |
| 2 | Functions Review |
| 3 | Complex Numbers |
| 4 | Quadratic Equations and Graphing Parabolas |
| 5 | Minima, Maxima, and Circles |
| 6 | Conics |
| 7 | Polynomial Division, the Remainder Theorem, the Factor Theorem |
| 8 | Integer and Rational Roots |
| 9 | Proof by Contradiction and Irrational Roots |
| 10 | Vieta's Formulas |
| 11 | Multivariable Polynomials |
| 12 | Advanced Strategies for Polynomials |
| 13 | Arithmetic and Geometric Sequences and Series |
| 14 | Advanced Sequences and Series |
| 15 | Induction |
| 16 | Exponents and Logarithms |
| 17 | Radicals, Monotonic, and Even and Odd Functions |
| 18 | Rational Functions and Partial Fractions |
| 19 | Piecewise Functions, Absolute Value, Integer and Fractional Part |
| 20 | Inequalities |
| 21 | Mean Inequality Chain |
| 22 | Cauchy Schwarz Inequality |
| 23 | Functional Equations |
| 24 | More Functional Equations and Challenging Problems |