

# How each AoPS Prealgebra chapter (Age 15) maps to the selected Common Core standards

Below is a chapter-by-chapter map using AoPS style language (rigor, structure, problem solving). For each chapter I list the primary standard(s) from your set, a short justification in AoPS terms, and one short classroom/example activity that demonstrates the alignment.

## 1. Chapter 1 — Properties of Arithmetic

- Primary CCSS link: A-SSE.1
- Why: This chapter treats the commutative, associative, and distributive laws and rigorous arithmetic definitions. A-SSE.1 asks students to *see structure* in expressions; knowing and applying these properties is the foundation for rewriting and factoring expressions (e.g., recognizing  $a(b+c)$  or grouping like terms).
- AoPS activity: Given a messy expression, ask students to rewrite it in a simpler, structured form using distributivity and associativity — then explain the rewrite as a short proof (AoPS style).

## 2. Chapter 2 — Exponents

- Primary CCSS link: A-SSE.1, N-Q.3 (secondary)
- Why: Exponent laws are part of recognizing structure in algebraic expressions (A-SSE.1). When students use exponents in scientific notation or measurement contexts, they practice choosing an appropriate level of accuracy and representation (N-Q.3).
- AoPS activity: Convert computations into power form to simplify, then interpret results in a measurement context (e.g., estimate population orders of magnitude and state appropriate precision).

## 3. Chapter 3 — Number Theory

- Primary CCSS link: A-SSE.1 (conceptual foundation), A-CED.1 (modeling contexts)
- Why: Prime factorization and the Fundamental Theorem give structural insight into integers—this is AoPS language for “seeing” and manipulating number structure. Problems that use LCM/GCD to set up equations or constraints connect to A-CED.1 when modeling relationships.
- AoPS activity: Pose a contest-style problem requiring prime factorization to construct or solve an equation (e.g., find all integers  $n$  satisfying conditions expressible as equations built from divisibility properties).

## 4. Chapter 4 — Fractions

- Primary CCSS link: N-Q.3, A-CED.1
- Why: Rigorous fraction work is essential for measurement, units, and modeling. Choosing appropriate precision with fractional answers and forming linear relationships (e.g., mixtures, ratios expressed as fractional equations) ties to N-Q.3 and A-CED.1.
- AoPS activity: Create and solve an algebraic model of a mixing problem where concentrations are fractions; discuss what precision is reasonable for the context.

## 5. Chapter 5 — Equations and Inequalities

- Primary CCSS link: A-CED.1, A-SSE.1
- Why: Students set up and solve linear equations from word problems (A-CED.1). Rewriting expressions to isolate variables and see structure is directly connected to A-SSE.1.
- AoPS activity: Given a contest word problem, have students define variables, create an equation or inequality, and justify each algebraic step — encourage multiple solution methods and structural rewriting.

## 6. Chapter 6 — Decimals

- Primary CCSS link: N-Q.3

- Why: Decimals are measurement representations. N-Q.3 asks students to choose appropriate levels of accuracy — converting between decimals and fractions and understanding truncation/rounding are central here.
- AoPS activity: Present a measurement task (e.g., engineering tolerance) and ask students to convert and state how many decimal places are justified and why.

#### 7. **Chapter 7 — Ratios, Conversions, and Rates**

- Primary CCSS link: A-CED.1, N-Q.3
- Why: Writing proportional relationships and unit-conversion equations are classic modeling tasks (A-CED.1). Deciding how to report rates or converted quantities with appropriate accuracy ties to N-Q.3.
- AoPS activity: Model a speed/distance/time scenario with an equation, solve for an unknown, and justify the choice of units and precision.

#### 8. **Chapter 8 — Percents**

- Primary CCSS link: A-CED.1, N-Q.3
- Why: Percent problems are often modeled by linear equations (A-CED.1); determining suitable rounding for financial percentages or error estimates uses N-Q.3.
- AoPS activity: Set up and solve a multi-step percent problem (discounts, tax, markups), then discuss how precise the final price should be in context.

#### 9. **Chapter 9 — Square Roots**

- Primary CCSS link: A-SSE.1, A-CED.1
- Why: Manipulating square roots and recognizing their form is part of structural work in algebra (A-SSE.1). Using square roots to express solutions of geometric or measurement problems leads to equations to model situations (A-CED.1).
- AoPS activity: Solve geometric problems that yield square-root lengths; simplify results and discuss sensible decimal approximations (N-Q.3 connection).

#### 10. **Chapter 10 — Angles**

- Primary CCSS link: Grade 7 geometry cluster
- Why: The 7th-grade geometry cluster focuses on understanding and solving geometry problems involving angle relationships, constructions, and reasoning. This chapter builds the angle vocabulary, alternate/interior/exterior angle relationships, and proof-style reasoning in AoPS language.
- AoPS activity: Give angle chase problems and short proofs using parallel lines and transversals; ask students to generalize and write concise justifications.

#### 11. **Chapter 11 — Perimeter and Area**

- Primary CCSS link: 6.G.1
- Why: 6.G.1 expects students to find areas of triangles and special quadrilaterals by decomposing or composing shapes. This chapter's rigorous look at area, decomposition techniques, and special cases directly supports that standard.
- AoPS activity: Have students decompose an irregular polygon into rectangles/triangles, compute area, and explain their decomposition strategy in a short proof.

#### 12. **Chapter 12 — Right Triangles and Quadrilaterals**

- Primary CCSS link: 8.G.5, 8.G.6 (conceptually), 8.G.7
- Why: 8.G.5–8.G.7 center on the Pythagorean theorem and distance in the coordinate plane. This chapter's Pythagorean proofs, Pythagorean triples, and applications to quadrilaterals map directly. If coordinate arguments or dilations are introduced (e.g., similarity, 30-60-90 scale factors), that supports 8.G.6 conceptually.
- AoPS activity: Solve problems finding unknown sides using Pythagorean triples; then apply Pythagorean theorem to compute distances between lattice points and justify steps.

#### 13. **Chapter 13 — Data and Statistics**

- Primary CCSS link: S-ID.1, S-ID.2, S-ID.3
- Why: These S-ID standards ask students to represent data with plots, describe distributions

(center, spread, shape), and interpret differences in context. This chapter's treatment of mean, median, mode, range, and graphical displays is a direct match.

- AoPS activity: Give a small dataset; ask students to create appropriate plots, compute summary statistics, and write a short interpretation comparing two distributions (AoPS expects precise, justification-style explanations).

#### 14. **Chapter 14 — Counting**

- Primary CCSS link: A-SSE.1 (structural thinking) and A-CED.1 (modeling when counting feeds equations)
- Why: Counting techniques develop combinatorial structure awareness (AoPS language: enumerative reasoning). Problems that model counts with equations or constraints are A-CED.1-type modeling tasks. Though the CCSS set you gave focuses less on combinatorics, counting is essential AoPS groundwork for structured algebraic reasoning.
- AoPS activity: Present a casework counting problem where students must set up and solve constraints algebraically, then explain why cases cover all possibilities.

#### 15. **Chapter 15 — Problem-Solving Strategies**

- Primary CCSS link: A-SSE.1, A-CED.1, S-ID.1–S-ID.3 (depending on context)
- Why: AoPS problem-solving techniques (find patterns, work backwards, draw pictures) are meta-skills that support the targeted CCSS standards: seeing structure in expressions, creating equations for modeling, and interpreting data. The strategies teach students how to approach CCSS tasks rigorously.
- AoPS activity: Give a multi-step applied problem (e.g., mixing or motion) and require students to pick a strategy, set up an equation/model, solve it, and justify each step.

## Quick cross-walk summary (which chapters best support each listed CCSS)

- **6.G.1:** Chapter 11 (Perimeter & Area)
- **Grade 7 Geometry cluster:** Chapter 10 (Angles), Chapters 11 and 12 as supporting material for reasoning about shapes
- **8.G.5–8.G.7:** Chapter 12 (Right Triangles and Quadrilaterals) — Pythagorean theorem, distance, and related reasoning
- **N-Q.3:** Chapters 2, 4, 6, 7, 8, 9 (decisions about representation and precision in measurement and numeric forms)
- **A-SSE.1:** Chapters 1, 2, 5, 9, 14, 15 (seeing structure in arithmetic and algebraic expressions)
- **A-CED.1:** Chapters 3, 4, 5, 7, 8, 12, 15 (translating contexts into equations: ratios, percents, linear models, geometric lengths)
- **S-ID.1–S-ID.3:** Chapter 13 (Data & Statistics)

## Tips for classroom implementation (AoPS style)

- Always pair procedural practice with short written justifications—AoPS emphasizes "why" as much as "how." That aligns students to CCSS expectations for reasoning.
- Use contest-style problems from each chapter as formative checks that require modeling (A-CED.1) or structural rewrites (A-SSE.1).
- When you cover measurement or numeric representation (decimals, scientific notation, square roots), explicitly ask students to state the level of accuracy they would report and why (N-Q.3).
- For geometry chapters, require short angle or area proofs (2–3 sentences) to build the geometric reasoning demanded in the middle-school standards.

If you want, I can:

- Produce a one-page teacher's pacing guide showing which lesson(s) from each chapter to use for teaching each CCSS standard, or
- Write 2-3 example problems per chapter explicitly labeled by which CCSS standard they target (student prompts + full AoPS-style solutions).