

How to read this mapping (quick)

Each chapter below lists which of the requested Common Core standards it supports, a short explanation in AoPS-style language (rigor, definitions, clever manipulations), and 1–2 recommended AoPS-style activities or problem types you can try to practice the exact standard.

1. Chapter 1 — Properties of Arithmetic

- *Standards:* A-SSE.1, A-CED.1 (supportive), N-Q.3 (foundational)
- *Why:* This chapter makes the algebraic structure of arithmetic explicit (commutative, associative, distributive, identities). AoPS-style emphasis: rigorous definitions and using properties to rewrite expressions cleverly — exactly what A-SSE.1 (seeing structure) asks for.
- *AoPS practice:*
 - Rewrite complicated expressions using distributive and associative laws to make computation trivial (mental math shortcuts).
 - Short proof-style problems: show why $(a+b)c = ac+bc$ and use that to simplify expressions before solving equations (prepares for A-CED.1).

2. Chapter 2 — Exponents

- *Standards:* A-SSE.1, N-Q.3
- *Why:* Exponent laws help you see structure in expressions (A-SSE.1). Negative and zero exponents and scientific-notation thinking connect directly to N-Q.3 (choosing & manipulating units and scales).
- *AoPS practice:*
 - Simplify expressions with multiple exponent rules and rewrite them to reveal factors (contest-flavored simplification).
 - Apply exponents to unit conversions (e.g., mm^3 to m^3) to practice N-Q.3-style unit sense.

3. Chapter 3 — Number Theory

- *Standards:* (Foundational for A-CED.1 and A-SSE.1; supports problem modeling)
- *Why:* Prime factorization, LCM/GCD and the Fundamental Theorem of Arithmetic give the rigorous number structure used when building or simplifying algebraic models and when reasoning about divisibility in equations. AoPS-style: proof and clever factor tricks.
- *AoPS practice:*
 - Solve integer-equation word problems using prime factorizations and divisibility constraints (a bridge to A-CED.1).
 - Competition-style problems: find all n that satisfy multiple divisibility conditions using LCM/GCD reasoning.

4. Chapter 4 — Fractions

- *Standards:* N-Q.3, A-SSE.1, A-CED.1 (applied)
- *Why:* Fractions are the language of precise quantities and unit parts. Rigorous arithmetic and simplification are necessary when you build expressions or equations involving parts of units (N-Q.3). Recognizing structure in fractional expressions supports A-SSE.1.
- *AoPS practice:*
 - Tough fraction word problems that require rewriting expressions to simplify before solving (contest-style).
 - Model percent or ratio problems using fractional equations (prepares for A-CED.1).

5. Chapter 5 — Equations and Inequalities

- *Standards:* A-CED.1 (primary), A-SSE.1 (supportive)
- *Why:* Creating and solving linear equations is exactly what A-CED.1 asks for (translate situations into equations). Inequalities and techniques for solving them are directly applicable to modeling and reasoning about quantities.

- *AoPS practice:*
 - Take word problems, define variables clearly, and set up equations (AoPS habit: name quantities and state assumptions).
 - Challenge problems: multi-step applications that need algebra + number tricks (e.g., integer constraints from Chapter 3).

6. Chapter 6 — Decimals

- *Standards:* N-Q.3, A-SSE.1
- *Why:* Decimal representation and manipulation are crucial for units, measurement, and interpreting quantities (N-Q.3). Recognizing decimal structure and converting to/from fractions helps with expression structure (A-SSE.1).
- *AoPS practice:*
 - Problems that require exact decimal reasoning and conversions (e.g., compare sums of decimals vs. fractions to spot simplifications).
 - Unit conversion tasks involving decimals (apply N-Q.3 unit sense).

7. Chapter 7 — Ratios, Conversions, and Rates

- *Standards:* N-Q.3, A-CED.1, S-ID.1–S-ID.3 (applied to rates)
- *Why:* Ratios and proportional reasoning are core to unit selection and conversion (N-Q.3). Setting up proportions and equations to solve rate problems is A-CED.1 work. The relationship between speed, distance, and time links to interpreting slope and rates in S-ID standards.
- *AoPS practice:*
 - Set up and solve proportion equations for mixture, scaling, and conversion problems (contest-style short answers).
 - Model speed/distance/time with equations and interpret resultant units and slopes (bridge to S-ID ideas).

8. Chapter 8 — Percents

- *Standards:* N-Q.3, A-CED.1
- *Why:* Percent problems are models of parts of a whole and change (increase/decrease). Translating percent situations into equations is direct A-CED.1 practice; paying attention to units and interpretation connects to N-Q.3.
- *AoPS practice:*
 - Careful modeling: turn percent increases/decreases into equations and solve backward (work backwards strategy).
 - Challenge: combined percent changes and successive applications (spot shortcuts using algebraic structure).

9. Chapter 9 — Square Roots

- *Standards:* A-SSE.1 (structure), supportive for modeling with radicals
- *Why:* Understanding square roots and simplifying radicals helps you rewrite expressions (A-SSE.1). Square roots appear when solving equations (A-CED.1) and in geometric length calculations (ties to geometry chapters).
- *AoPS practice:*
 - Simplify radical expressions and use them in short algebra problems and triangle-length problems.
 - Explore Pythagorean triples as neat integer examples that make square-root reasoning exact.

10. Chapter 10 — Angles

- *Standards:* Grade 7 geometry cluster (primary), 8.G.5–8.G.7 (support when used for similarity)
- *Why:* Angle relationships (parallel lines, triangle angle sums, polygon-angle facts) are core items in the 7th-grade geometry standards. When angle ideas are used to set up similarity or dilation reasoning, they support the 8th-grade similarity standards (8.G.5–8.G.7).

- *AoPS practice:*
 - Proof-style angle problems: justify equal and supplementary angles using definitions and properties.
 - Use angle facts to set up similarity problems (prepare for 8th-grade similarity work).

11. Chapter 11 — Perimeter and Area

- *Standards:* 6.G.1 (primary), Grade 7 geometry cluster (scaling and decomposing polygons), N-Q.3 (units)
- *Why:* 6.G.1 asks students to find areas of triangles and other polygons by decomposing or composing shapes — exactly the skills in this chapter. AoPS rigor: decompose complex regions, reason about units of area, and solve unusual area problems.
- *AoPS practice:*
 - Decompose irregular polygons into triangles/rectangles and compute area (step-by-step proofs of decomposition).
 - Challenge problems: area with missing pieces or clever rearrangements; track square-unit conversions (N-Q.3).

12. Chapter 12 — Right Triangles and Quadrilaterals

- *Standards:* 8.G.5–8.G.7 (similarity and geometric reasoning), Grade 7 geometry cluster
- *Why:* The Pythagorean Theorem, similarity of right triangles, special right triangles (30–60–90, 45–45–90), and Pythagorean triples connect to 8th-grade similarity and using similarity to solve problems. Quadrilateral classification and area tie back to 7th-grade geometry ideas.
- *AoPS practice:*
 - Prove relationships in right triangles using similarity and use them to solve length problems (8.G-style reasoning).
 - Work with special triangles and Pythagorean triples to create exact-length examples and contest-style integer geometry problems.

13. Chapter 13 — Data and Statistics

- *Standards:* S-ID.1–S-ID.3 (primary)
- *Why:* These CCSS statistics standards ask you to represent data with plots, interpret what patterns mean, and use linear models to describe data. Chapter 13's focus on mean/median/mode, types of graphs, and limits of basic statistics matches those S-ID standards directly.
- *AoPS practice:*
 - Construct dot plots, histograms, and scatterplots from data and practice describing trends and centers with precise language.
 - Fit simple linear descriptions to data (interpret slope and intercept informally) to practice S-ID.3-style reasoning.

14. Chapter 14 — Counting

- *Standards:* S-ID (introductory probability connections), supportive for A-CED.1 when counting outcomes in models
- *Why:* Counting techniques (multiplication principle, casework, Venn diagrams) are essential for probability and for reasoning about number of possible outcomes when you set up algebraic models. AoPS-style reasoning stresses careful casework and avoiding overcounting, which is vital in modeling and interpreting data.
- *AoPS practice:*
 - Competition-style counting problems: count arrangements, apply symmetry, and do casework cleanly.
 - Use counting to compute probabilities in simple experiments and interpret results as early S-ID probability work.

15. Chapter 15 — Problem-Solving Strategies

- *Standards:* Cross-cutting — supports all listed standards (6.G.1, 7th-grade geometry cluster,

8.G.5–8.G.7, N-Q.3, A-SSE.1, A-CED.1, S-ID.1–S-ID.3)

- *Why*: Strategies like find a pattern, make a list, draw a picture, work backwards, and casework are the AoPS bread-and-butter. These approaches are how you attack modeling (A-CED.1), interpretation (S-ID), geometric construction and decomposition (6–8 geometry), and units/quantity reasoning (N-Q.3).
- *AoPS practice*:
 - Practice each strategy on 1–2 representative problems: e.g., 'work backwards' on percent-change problems, 'draw a picture' on geometry area/decomposition tasks, 'casework' on counting problems.
 - Reflective step: write a 2-sentence explanation of which strategy you used and why — builds rigorous mathematical communication.

Short suggested sequence for applying the mapping (step-by-step for a 13-year-old)

1. Start by reading chapters 1–4 to build algebraic structure and number sense (A-SSE.1, N-Q.3 basics).
2. Move to chapters 5–9 to practice creating equations and manipulating expressions (A-CED.1 and structure work), making sure to do modeling problems that include units.
3. Study geometry chapters 10–12 with the AoPS habit of proving and decomposing shapes — this hits 6.G.1, the 7th-grade cluster, and 8.G similarity ideas.
4. Use chapters 7, 8, and 13 to apply unit, rate, and statistical interpretation (N-Q.3 and S-ID.1–S-ID.3). Always set up a variable and an equation for word problems (A-CED.1).
5. Finish with counting and problem-solving (chapters 14–15) to tie strategies into all standards — practice contest-style problems and explain your strategy each time.

If you want, I can:

- Produce a one-page printable alignment table for classroom use (chapter → standard → 1 example problem).
- Create 3 AoPS-style practice problems (with solutions) that show exactly how a chapter maps to a specific listed standard (pick which chapter and standard).

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