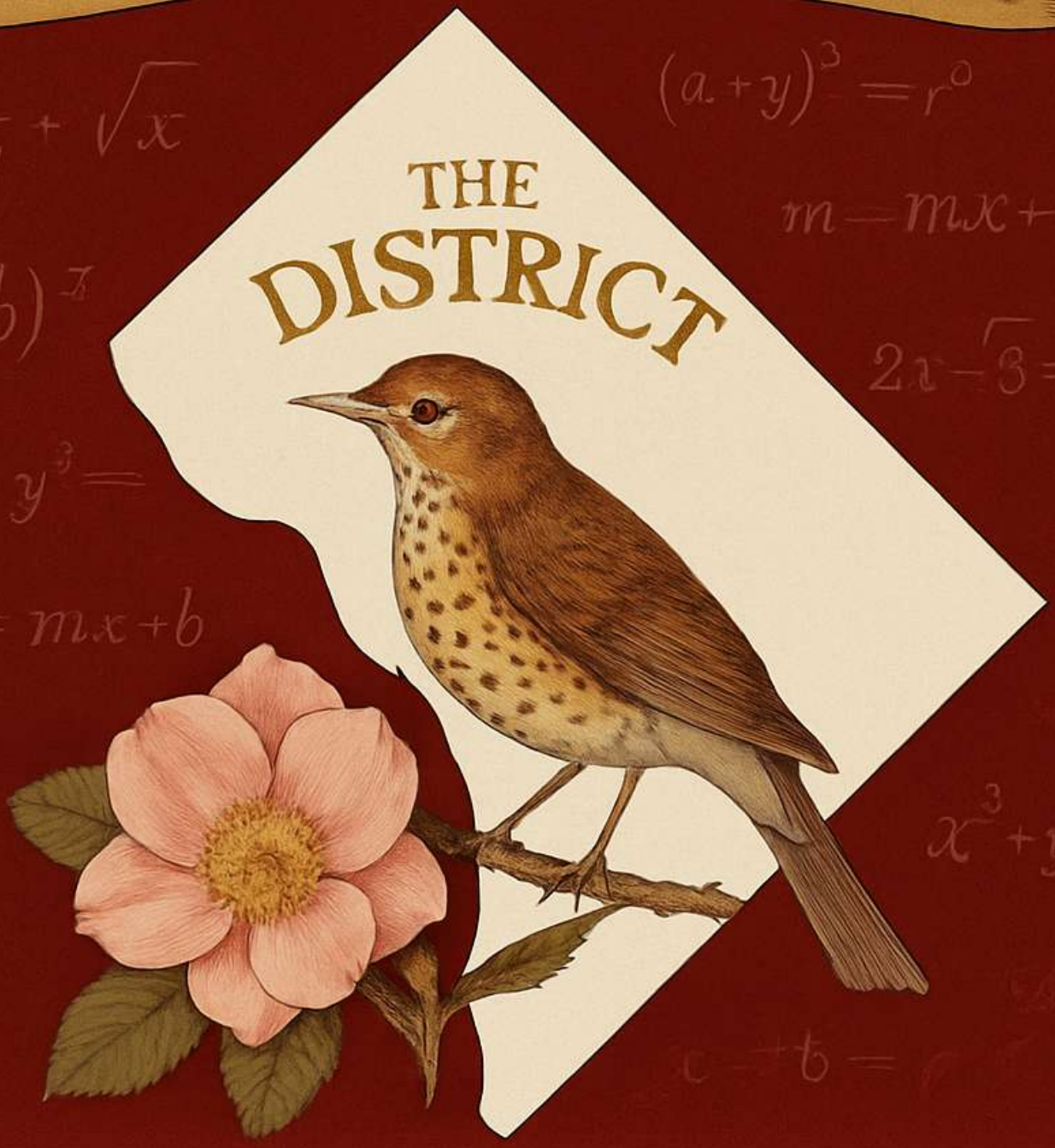
DISTRICT OF COLUMBIA



ALGEBRA I WORKBOOK

PRACTICE PROBLEMS TO MASTER ALGEBRA I

$y = mx + b$

$a^2 + b^2 = c^2$

WORKBOOK

District of Columbia

Algebra I Workbook

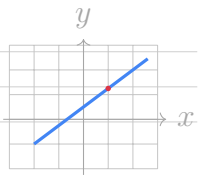
Comprehensive Practice, Challenging Exercises, and

Strategic Guidance for Complete Test-Day Confidence

- ☐ Topic practice with room to work, check, and correct mistakes.
- ☐ Mixed review that keeps earlier Algebra I skills active.
- ☐ Practice tests and explanations for final readiness.

Skill Check

1. Solve: $2x + 5 = 17$
2. Factor: $x^2 - 9$
3. Interpret the slope.



$f(x)$

Reza Nazari

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District of Columbia Algebra I Standards

Every topic in this book is built around the official District of Columbia Algebra I standards. The list below shows the standards used by the topics in this book. Codes are kept in the state reference format, so each state keeps its own code style instead of a generic numbered list.

Use this page as a map while you study. Every code listed here appears beside at least one topic heading, and some topics naturally connect to two or three standards.

How to use this list:

- **Before you start** — skim the standards to see the big picture of what Algebra I covers.
- **As you study** — connect the code beside a topic to the skill it strengthens.
- **Before the test** — use the list as a final checklist for your review.

A-APR

This section treats polynomials as algebraic building blocks: students add, subtract, multiply, and rewrite them so they can be used in equations and models.

A-APR	Perform arithmetic operations on polynomials
A-APR.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

A-CED

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Here, students turn situations into algebra: equations, inequalities, and formulas that describe relationships, limits, and constraints.

A-CED	Create equations that describe numbers or relationships
A-CED.1	Create equations and inequalities in one variable including ones with absolute value and use them to solve problems.
A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A-CED.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.
A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

A-REI

This section is about solving with reasons: equations, inequalities, and systems are connected to their tables, graphs, and real solution sets.

A-REI	Understand solving as a reasoning process and solve equations and inequalities
A-REI.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
A-REI.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A-REI.4	Solve quadratic equations in one variable.
A-REI.5	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A-REI.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
A-REI.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
A-REI.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
A-REI.11	Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
A-REI.12	Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
A-REI.3.1	Solve one-variable equations and inequalities involving absolute value, graphing the solutions and interpreting them in context.

A-REI.4

This section is about solving with reasons: equations, inequalities, and systems are connected to their tables, graphs, and real solution sets.

A-REI.4.a	Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
A-REI.4.b	Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.

A-SSE

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CHAPTER

1

Foundations of Algebra

1 Variables, Expressions, and Properties — A-SSE.1.a, A-SSE.1.b

2 Order of Operations and Evaluating Expressions — A-SSE.2, A-SSE.1.a

3 Simplifying Algebraic Expressions — A-SSE.2

4 Introduction to Equations and Solutions — A-CED.1

5 Personal Financial Literacy — N-Q.1

1.1 Variables, Expressions, and Properties

A-SSE.1.a A-SSE.1.b

Quick Review and Helpful Hints

Parts of an Expression: A **variable** is a letter that stands for an unknown value (e.g. x, n). A **coefficient** is the number multiplied by a variable (7 in $7x$). A **constant** is a number on its own ($+5$ in $7x+5$). A **term** is a single piece of an expression separated by $+$ or $-$ signs. For example, $3x^2-2x+9$ has three terms: $3x^2$, $-2x$, and 9.

Properties of Real Numbers:

Commutative: $a+b=b+a\,,\quad ab=ba$

Associative: $(a+b)+c=a+(b+c)\,,\quad (ab)c=a(bc)$

Distributive: $a(b+c)=ab+ac$

Identity: $a+0=a\,,\quad a\cdot 1=a$

Inverse: $a+(-a)=0\,,\quad a\cdot\dfrac{1}{a}=1\ (a\neq 0)$

Example: Identify the coefficient, variable, and constant in the expression $4x+9$. Then name the property used to rewrite $4x+9$ as $9+4x$.

The expression $4x+9$ has two terms. In the first term, 4 is the **coefficient** and x is the **variable**. The second term, 9, is a **constant** because it has no variable. Swapping the two terms uses the **Commutative Property of Addition**: $a+b=b+a$.

Answer: Coefficient $=4$; variable $=x$; constant $=9$; Commutative Property

Practice Problems

Simplify each expression or name the property.

1. $3(x+4)=$ _____
2. $2(5a-1)=$ _____
3. $7+x=x+7$ uses _____
4. $4\cdot(3\cdot y)=(4\cdot 3)\cdot y$ uses _____
5. $6(2n+3)=$ _____
6. $-3(4-2x)=$ _____
7. $5m+0=$ _____
8. $8+(x+2)=(8+x)+2$ uses _____
9. $9(a-5)+2=$ _____
10. $-2(3x+4)-x=$ _____
11. $4(x+1)+3(x-2)=$ _____
12. $7\cdot\frac{1}{7}=$ _____

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Word Problems

13. A movie ticket costs $\$d$ and a bag of popcorn costs \$3 less than the ticket. Write an expression for the total cost of 2 tickets and 2 bags of popcorn. Then simplify using the distributive property. _____

14. Jasmine says $3(x+5)$ and $3x+5$ are equivalent expressions because she "moved the parentheses." Are the expressions equivalent? Simplify $3(x+5)$ and decide whether it equals $3x+5$. _____

1.2 Order of Operations and Evaluating Expressions

A-SSE.2 A-SSE.1.a

Quick Review and Helpful Hints

PEMDAS / Order of Operations: When an expression has more than one operation, always follow this order:

P — Parentheses (and other grouping symbols) first
E — Exponents (powers and roots)
M/D — Multiplication and Division, left to right
A/S — Addition and Subtraction, left to right

Evaluating an Algebraic Expression: Replace each variable with its given value, place the value in parentheses, then simplify using PEMDAS. For example, evaluate $3x^2-1$ when $x=-2$: $3(-2)^2-1=3(4)-1=12-1=11$.

Example: Simplify: $6+2\times(5-1)^2\div 4$.

Start inside the parentheses: $5-1=4$. Next, handle the exponent: $4^2=16$. Then multiply/divide left to right: $2\times 16=32$, then $32\div 4=8$. Finally, add: $6+8=14$.

Answer: 14