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ALGEBRA I

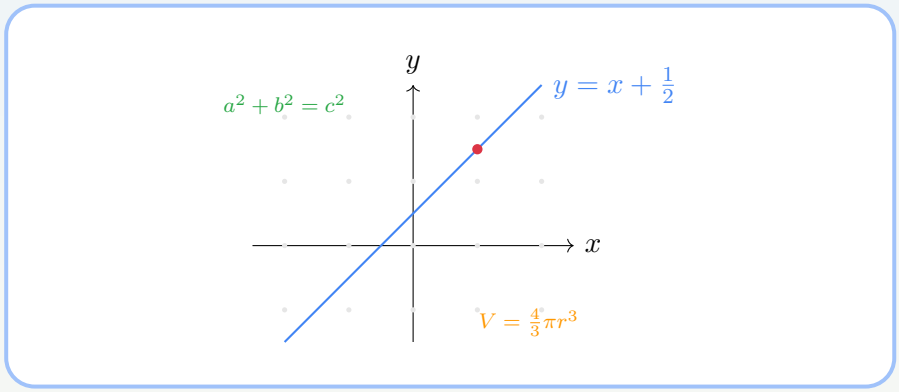
MADE RIDICULOUSLY SIMPLE

★ THE ULTIMATE STUDY GUIDE TO ACE ALGEBRA I ★

Indiana Algebra I

Made Ridiculously Simple

Comprehensive Practice, Challenging Exercises, and Strategic Guidance for Complete Test-Day Confidence



Reza Nazari

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AI.L.2 Represent linear functions as graphs from equations (with emphasis on technology), equations from graphs, and equations from tables and other given information (e.g., from a given point on a line and the slope of the line). Find the equations of a line in a slope-intercept, point-slope, and standard forms. Reveal more or less information about a given situation based on the form used.

AI.L.4 Solve linear and quadratic equations and formulas for a specified variable to highlight a quantity of interest, using the same reasoning as in solving equations. (E)

AI.NF.1 Simplify square roots of monomial algebraic expressions, including non-perfect squares.

AI.NF.2 Add, subtract, and multiply polynomials. Divide polynomials by monomials. Use these operations to rewrite algebraic expressions in equivalent forms, and justify them with algebraic properties. (E)

AI.NF.3 Extend understanding of independent/dependent variables to encompass domain/range, as applied to relations using tables, graphs, verbal descriptions, and equations. (E)

AI.NF.4 Evaluate functions for given elements of the domain, and interpret statements in function notation in terms of a context.

AI.NF.5 Describe, qualitatively, the functional relationship between two quantities by analyzing key features of a graph. Sketch a graph that exhibits given key features of a function that has been verbally described, including intercepts, where the function is increasing or decreasing, where the function is positive or negative, and any relative maximum or minimum values. Identify the independent and dependent variables. (E)

AI.QE.1 Distinguish between situations that can be modeled with linear functions and exponential functions. Understand that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. Compare linear functions and exponential functions that model real-world situations using tables, graphs, and equations. (E)

AI.QE.2 Represent real-world and other mathematical problems that can be modeled with simple exponential functions using tables, graphs, and equations of the form $y = abx$ (for integer values of $x > 1$, rational values of $b > 0$ and $b \neq 1$) with and without technology; interpret the values of a and b.

AI.QE.3 Solve quadratic equations in one variable by inspection (e.g., for $x2 = 49$), finding square roots, using the quadratic formula, and factoring, as appropriate to the initial form of the equation.

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AI.QE.4 Represent real-world problems using quadratic equations in one or two variables and solve such problems with technology. Interpret the solution(s), and determine whether they are reasonable. (E)

AI.SEI.1 Represent real-world problems using linear inequalities in two variables and solve such problems; interpret the solution set, and determine whether it is reasonable. Graph the solutions to a linear inequality in two variables as a half-plane. (E)

AI.SEI.2 Write and graph a system of two linear equations in two variables that represents a real-world problem and solve the problem graphically and algebraically with and without technology. Interpret the solution, and determine whether the solution is reasonable. (E)

Table of Contents

★ 1 Foundations of Algebra 13

★ 2 Solving Linear Equations 19

★ 3 Inequalities and Absolute Value 32

★ 4 Relations, Functions, and Sequences 43

★ 5 Linear Functions and Their Graphs 65

★ 6 Systems of Equations and Inequalities 90

★ 7 Exponents, Polynomials, and Real Numbers 104

★ 8 Factoring 116

★ 9 Quadratic Functions and Equations 127

★ 10 Statistics and Probability 145

★ 11 Exponential Functions and Modeling 165

★ Prepare for the Indiana Algebra 1 Test 174

★ Test-Taking Strategies 177

★ Practice Test 1 180

★ Practice Test 2 196

★ Practice Test Answers and Explanations 212

★ Chapter Practices Answers and Explanations 219

2.1 Solving One-Step Equations

AI.DS.3

A one-step equation is the simplest type of equation — you only need one operation to find the answer. The key idea is to use an inverse operation (the opposite of what is being done to the variable) to isolate it. In this section you will solve equations that involve adding, subtracting, multiplying, or dividing, and you will always check your answer by substituting it back into the original equation.

Key Concepts & Quick Review

Inverse Operations: To solve a one-step equation, perform the **inverse** (opposite) operation on both sides to isolate the variable.

Addition $\longrightarrow$ undo with **subtraction**

Subtraction $\longrightarrow$ undo with **addition**

Multiplication $\longrightarrow$ undo with **division**

Division $\longrightarrow$ undo with **multiplication**

Checking Your Answer: Substitute your solution back into the original equation. If both sides are equal, the solution is correct.

Examples

① Solve $x + 7 = 15$.

The variable x has 7 added to it, so subtract 7 from both sides: $x + 7 - 7 = 15 - 7$, which gives $x = 8$. Check: $8 + 7 = 15$ ✓

Answer: $x = 8$

② Solve $-4x = 28$.

The variable x is multiplied by -4, so divide both sides by -4: $\frac{-4x}{-4} = \frac{28}{-4}$, which gives $x = -7$. Check: $-4(-7) = 28$ ✓

Answer: $x = -7$

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Practice Problems

Solve each equation. Write your answer on the line.

1. $x + 5 = 12$ _____

2. $n - 3 = 10$ _____

3. $y + 9 = -2$ _____

4. $a - 7 = -1$ _____

5. $3x = 21$ _____

6. $-5m = 35$ _____

7. $\frac{x}{4} = 6$ _____

8. $\frac{n}{-3} = 9$ _____

9. $8p = -56$ _____

10. $x + 2.5 = 7$ _____

11. $\frac{y}{5} = -4$ _____

12. $w - 1.8 = 3.2$ _____

Study Tips

- Think of an equation like a balanced scale—whatever you do to one side, you **must** do the same to the other.
- If the variable is multiplied by a fraction, multiply both sides by the reciprocal of that fraction. For example: $\frac{2}{3}x = 10 \Rightarrow x = 10 \times \frac{3}{2} = 15$.
- Always **check** your answer by substituting it back into the original equation.

Word Problems

13. Liam had some money in his wallet. After spending \$12 on lunch, he has \$23 left. Write and solve an equation to find how much he started with.

_____

14. A recipe needs 5 equal cups of flour, totalling 20 ounces. How many ounces are in each cup?

_____

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2.2 Solving Two-Step Equations

AI.DS.3

Two-step equations require exactly two moves to isolate the variable. The trick is to undo the operations in reverse order — deal with addition or subtraction first, then handle multiplication or division. In this section you will practice solving two-step equations step by step, justify each move with properties of equality, and apply these skills to real-world problems.

Key Concepts & Quick Review

Two-Step Strategy: A two-step equation has the form $ax + b = c$. Solve it in **reverse order** of operations:

Step 1 — Add or subtract to move the constant away from the variable term. **Step 2** — Multiply or divide to isolate the variable.

Properties of Equality: Each step is justified by one of these: *Addition/Subtraction Property* (add/subtract the same number on both sides) or *Multiplication/Division Property* (multiply/divide the same nonzero number on both sides).

Examples

① Solve $3x + 5 = 20$.

Step 1: Subtract 5 from both sides: $3x = 15$. Step 2: Divide both sides by 3: $x = 5$. Check: $3(5) + 5 = 15 + 5 = 20$ ✓

Answer: $x = 5$

② Solve $\frac{n}{4} - 3 = 7$.

Step 1: Add 3 to both sides: $\frac{n}{4} = 10$. Step 2: Multiply both sides by 4: $n = 40$. Check: $\frac{40}{4} - 3 = 10 - 3 = 7$ ✓

Answer: $n = 40$

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