KANSAS



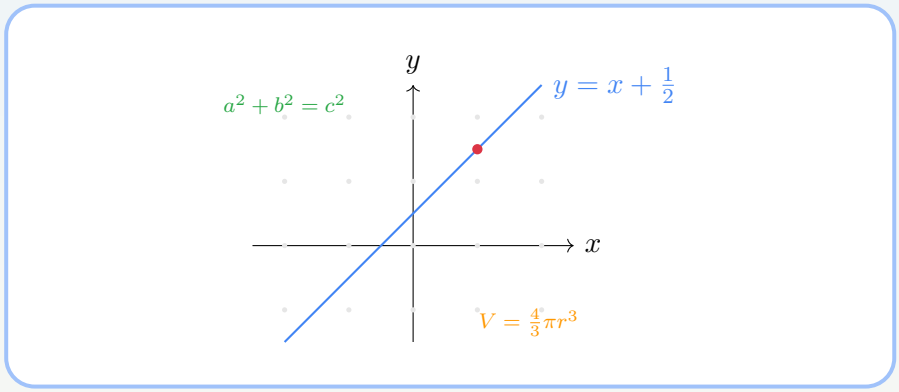
ALGEBRA I MADE RIDICULOUSLY SIMPLE

THE ULTIMATE STUDY GUIDE TO ACE ALGEBRA I

Kansas Algebra I

Made Ridiculously Simple

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



Reza Nazari

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A.REI.3	Solve equations in one variable and give examples showing how extraneous solutions may arise.
A.REI.5	Solve quadratic equations and inequalities.
A.REI.8	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.10	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.3a	Solve rational, absolute value and square root equations.
A.REI.5a	Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives no real solutions.
A.REI.6b	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.
A.REI.6c	Solve real-world and mathematical problems leading to two linear equations in two variables.
A.SSE.1	Interpret expressions that represent a quantity in terms of its context.
A.SSE.2	Use the structure of an expression to identify ways to rewrite it.
A.SSE.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
A.SSE.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1 + r)n as the product of P and (1 + r)n.
A.SSE.3a	Factor a quadratic expression to reveal the zeros of the function it defines.
F.BF.3	Transform parent functions (f(x)) by replacing f(x) with f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

F.IF.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
F.IF.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
F.IF.3	Recognize patterns in order to write functions whose domain is a subset of the integers.
F.IF.4	For a function that models a relationship between two quantities, interpret key features of expressions, graphs and tables in terms of the quantities, and sketch graphs showing key features given a description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
F.IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
F.IF.6	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
F.IF.9	Compare properties of two functions using a variety of representations (algebraically, graphically, numerically in tables, or by verbal descriptions).
F.IF.7a	Graph linear, quadratic and absolute value functions and show intercepts, maxima, minima and end behavior.
N.Q.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
N.Q.2	Define appropriate quantities for the purpose of descriptive modeling.
N.Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
N.RN.1	Know and apply the properties of integer exponents to generate equivalent numerical and algebraic expressions.
S.ID.1	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S.ID.2 Interpret differences in shape, center, and spread in the context of the data sets using dot plots, histograms, and box plots, accounting for possible effects of extreme data points (outliers).

S.ID.4 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

S.ID.6 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S.ID.5b Fit a linear function to data and use it to solve problems in the context of the data.

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✎ Practice Problems

Simplify each expression. Write your answer on the line.

1. $5x + 3x =$ _____

2. $7a - 2a + 4 =$ _____

3. $2(x + 6) =$ _____

4. $-3(2y - 5) =$ _____

5. $4m + 3 - 2m + 1 =$ _____

6. $6(n + 2) - 4n =$ _____

7. $3(x - 4) + 2(x + 1) =$ _____

8. $-5(2p + 3) + 8p =$ _____

9. $7 - 3(k - 2) =$ _____

10. $2(a + b) + 3(a - b) =$ _____

11. $\frac{1}{2}(4x + 8) =$ _____

12. $-4(x - 3) + 4x =$ _____

Study Tips

- ☞ Always distribute **before** you combine like terms. Skipping the distributive step is the most common mistake.
- ☞ Watch the sign in front of each term carefully. $-2(3a - 1)$ gives $-6a+2$, not $-6a - 2$.
- ☞ After simplifying, check your work by plugging in a simple number (like $x = 1$) into both the original and simplified expressions—they should give the same result.

✍ Word Problems

13. A rectangular garden has a length of $(3x + 2)$ feet and a width of $(x + 4)$ feet. Write and simplify an expression for the perimeter. _____

14. Mia buys 3 notebooks at $(n + 1)$ dollars each and 2 pens at $(n - 2)$ dollars each. Write and simplify an expression for her total cost. _____

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1.4 Introduction to Equations and Solutions

A.REI.1 A.CED.1

An equation is a mathematical sentence that says two expressions are equal, and your job is to find the value that makes it true. In this section you will learn what it means for a number to be a solution of an equation, how to check a solution by plugging it back in, and how to translate everyday word problems into algebraic equations. This is where algebra starts to feel like detective work — you are finding the unknown!

Key Concepts & Quick Review

What Is an Equation? An **equation** is a mathematical sentence that uses an equals sign (=) to show that two expressions have the same value. For example, $2x + 3 = 11$ says "two times some number plus three equals eleven."

Solution of an Equation: A value that makes the equation **true** when substituted for the variable. To check, replace the variable with the value and simplify both sides. If both sides are equal, the value is a solution.

Equivalent Equations: Two equations are **equivalent** when they have exactly the same solution(s). You can produce an equivalent equation by adding or subtracting the same number on both sides, or by multiplying or dividing both sides by the same nonzero number. For example, $x + 3 = 10$ and $x = 7$ are equivalent — both are true only when $x = 7$.

Translating Words to Equations: Key phrases signal operations: "sum" or "more than" $\rightarrow +$, "difference" or "less than" $\rightarrow -$, "product" or "times" $\rightarrow \times$, "quotient" or "divided by" $\rightarrow \div$, "is" or "equals" $\rightarrow =$.

Examples

① Is $x = 5$ a solution of $3x - 7 = 8$?

Substitute 5 for x: $3(5) - 7 = 15 - 7 = 8$. The left side equals the right side ($8 = 8$), so $x = 5$ is a solution.

Answer: *Yes*

② Translate into an equation and check if $n = 4$: "Six more than twice a number is 14."

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"Twice a number" is $2n$; "six more than" means $+6$; "is" means $=$. Equation: $2n + 6 = 14$. Substitute $n = 4$: $2(4) + 6 = 8 + 6 = 14$. ✓Since $14 = 14$, the value $n = 4$ is a solution.

Answer: *$2n + 6 = 14$; Yes, $n = 4$ is a solution*

✎ Practice Problems

Determine whether the given value is a solution (Yes/No), or translate the sentence into an equation. Write your answer on the line.

1. $x + 9 = 14;\ x = 5$? _____

2. $2x - 3 = 7;\ x = 5$? _____

3. $4a + 1 = 17;\ a = 3$? _____

4. $5n - 10 = 0;\ n = 2$? _____

5. $\frac{x}{3} = 6;\ x = 18$? _____

6. $3(y - 2) = 12;\ y = 6$? _____

7. "A number plus 8 is 15" → _____

8. "Three times a number is 21" → _____

9. "A number minus 4 equals 10" → _____

10. $7 - x = 3;\ x = 4$? _____

11. $2(x + 3) = 14;\ x = 4$? _____

12. "Half a number is 9" → _____

Study Tips

- To check a solution, always **substitute** the value back into the original equation and simplify both sides.
- When translating words, underline the key phrase that tells you the operation, and circle the word that means "=."
- An equation can have one solution, no solution, or many solutions. At this stage, focus on deciding whether a specific value works.

✍ Word Problems

13. A gym membership costs a one-time sign-up fee of \$25 plus \$10 per month. After m months, the total cost is $10m + 25$. Carlos has paid \$75 so far. Write an equation and determine the number of months. _____

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