KENTUCKY



ALGEBRA I

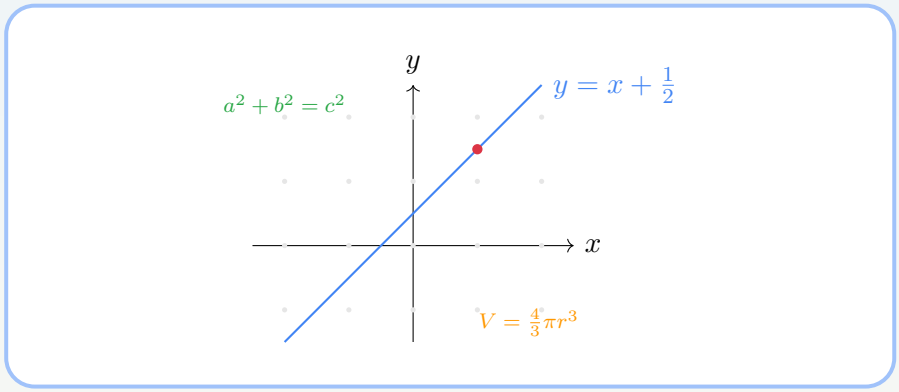
MADE RIDICULOUSLY SIMPLE

★ THE ULTIMATE STUDY GUIDE TO ACE ALGEBRA I ★

Kentucky Algebra I

Made Ridiculously Simple

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



Reza Nazari

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KY.HS.A.16	Understand 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.
KY.HS.A.18	Solve linear equations and inequalities in one variable, including literal equations with coefficients represented by letters.
KY.HS.A.23	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.
KY.HS.A.1.a	Interpret parts of an expression, such as terms, factors and coefficients.
KY.HS.A.1.b	Interpret complicated expressions, given a context, by viewing one or more of their parts as a single entity.
KY.HS.A.3.b	Factor a quadratic expression to reveal the zeros of the function it defines.
KY.HS.A.3.c	Use the properties of exponents to rewrite exponential expressions.
KY.HS.A.19.a	Solve quadratic equations by taking square roots, 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.
KY.HS.A.20.b	Solve systems of linear equations with graphs, substitution and elimination, focusing on pairs of linear equations in two variables.
KY.HS.A.25.a	Graph the solutions to a linear inequality as a half-plane (excluding the boundary in the case of a strict inequality).
KY.HS.F.2	Recognize that arithmetic and geometric sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
KY.HS.F.7	Use arithmetic and geometric sequences to model situations and scenarios.
KY.HS.F.12	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
KY.HS.F.13	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
KY.HS.F.14	Interpret the parameters in a linear or exponential function in terms of a context.

KY.HS.F.1.a	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, x is an element of its domain, then f(x) denotes the output of f corresponding to the input x.
KY.HS.F.1.b	Using appropriate function notation, evaluate functions for inputs in their domains and interpret statements that use function notation in terms of a context.
KY.HS.F.1.c	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities and sketch graphs showing key features given a verbal description of the relationship.
KY.HS.F.1.d	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
KY.HS.F.1.e	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
KY.HS.F.3.a	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval.
KY.HS.F.4.a	Graph linear and quadratic functions and show intercepts, maxima and minima.
KY.HS.F.6.a	Determine an explicit expression, a recursive process, or steps for calculation from a context.
KY.HS.F.6.b	Combine standard function types using arithmetic operations.
KY.HS.F.11.a	Recognize and justify that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.
KY.HS.F.11.b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
KY.HS.F.11.c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
KY.HS.N.1	Extend the properties of integer exponents to rational exponents, allowing for the expression of radicals in terms of rational exponents.
KY.HS.N.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.
KY.HS.N.4	Use units in context as a way to understand problems and to guide the solution of multi-step problems;
KY.HS.N.5	Define appropriate units in context for the purpose of descriptive modeling.

KY.HS.N.6	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
KY.HS.N.4.b	Choose and interpret the scale and the origin in graphs and data displays.
KY.HS.SP.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
KY.HS.SP.6.a	Calculate an appropriate mathematical model, or use a given mathematical model, for data to solve problems in context.
KY.HS.SP.6.b	Informally assess the fit of a model (through calculating correlation for linear data, plotting, calculating and/or analyzing residuals).
KY.HS.SP.8.a	Use technology to compute correlation coefficient of a linear fit.
KY.HS.SP.8.c	Describe the limitations of correlation when establishing causation.

✎ 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

KY.HS.A.16 KY.HS.A.12

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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