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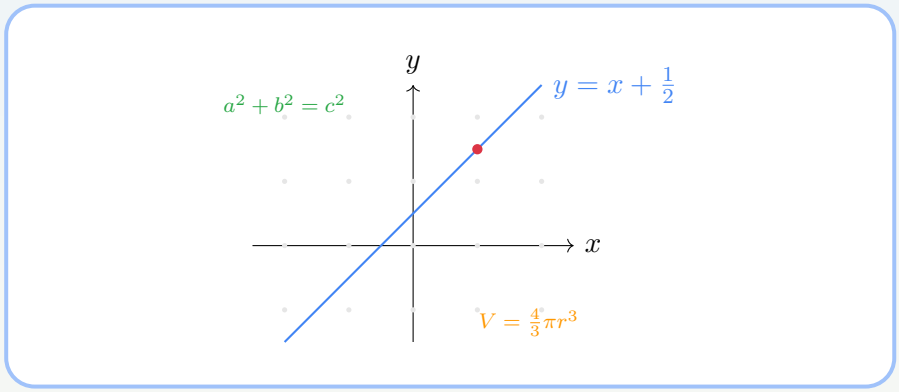
ALGEBRA I
MADE RIDICULOUSLY SIMPLE

THE ULTIMATE STUDY GUIDE TO ACE ALGEBRA I

New Jersey 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.B.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.B.4.b	Solve quadratic equations by inspection (e.g., for x2 = 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.REI.C.6	Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.
A.REI.D.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.D.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.D.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.SSE.A	Interpret the structure of expressions.
A.SSE.A.1.a	Interpret parts of an expression, such as terms, factors, and coefficients.
A.SSE.A.1.b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
A.SSE.B.3.a	Factor a quadratic expression to reveal the zeros of the function it defines.
A.SSE.B.3.b	Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
A.SSE.B.3.c	Use the properties of exponents to transform expressions for exponential functions.
F.BF.A.1.a	Determine an explicit expression, a recursive process, or steps for calculation from a context.

F.BF.B.3	Identify the effect on the graph of replacing f(x) by 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.
F.IF.A.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.A.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.A.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
F.IF.B.4	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.
F.IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
F.IF.B.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.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
F.IF.C.7.a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
F.IF.C.7.b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
F.IF.C.7.e	Graph exponential and logarithmic functions, showing intercepts and end behavior.
F.IF.C.8.a	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
F.LE.A.2	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).

F.LE.A.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
F.LE.A.1.a	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
F.LE.A.1.b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
F.LE.A.1.c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
F.LE.B.5	Interpret the parameters in a linear or exponential function in terms of a context.
N.Q.A.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.A.2	Define appropriate quantities for the purpose of descriptive modeling.
N.Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
S.ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
S.ID.A.2	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.A.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
S.ID.B.6.a	Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.
S.ID.B.6.b	Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
S.ID.B.6.c	Fit a linear function for a scatter plot that suggests a linear association.
S.ID.C.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
S.ID.C.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.

14. Marcus earns d dollars per hour and works h hours per week. His weekly pay after a \$15 deduction for parking is $dh - 15$. Calculate his weekly pay when $d = 12$ and $h = 20$.

_____

1.3 Introduction to Equations and Solutions

A.REI.A.1 | A.REI.B.3

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" $\rightarrow =$.

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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."

"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.

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☞ 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. _____

14. Priya says that $x = 3$ is a solution of $2x + 4 = 12$. Check whether $x = 3$ makes the equation true. _____

1.4 Personal Financial Literacy

N.Q.A.1 N.Q.A.2 N.Q.A.3

Algebra is not just for the classroom — it helps you make smart money decisions in real life. In this section you will learn how to calculate simple and compound interest, compare savings and loan options, and solve problems involving tax, commission, markup, and discount. You will also see how compounding works over time and why even small interest rates can make a big difference.

Key Concepts & Quick Review

Simple Interest: $I = Prt$, where P is the principal (starting amount), r is the annual interest rate (as a decimal), and t is the time in years. Total amount after t years: $A = P + Prt = P(1 + rt)$.

Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where n is the number of times interest is compounded per year. When compounded annually, $n = 1$.

Percent Applications: Discount: Sale Price = Original − Original × discount rate. Tax: Total = Price + Price × tax rate. Commission: Earnings = sales × commission rate.

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