NORTH DAKOTA



ALGEBRA I

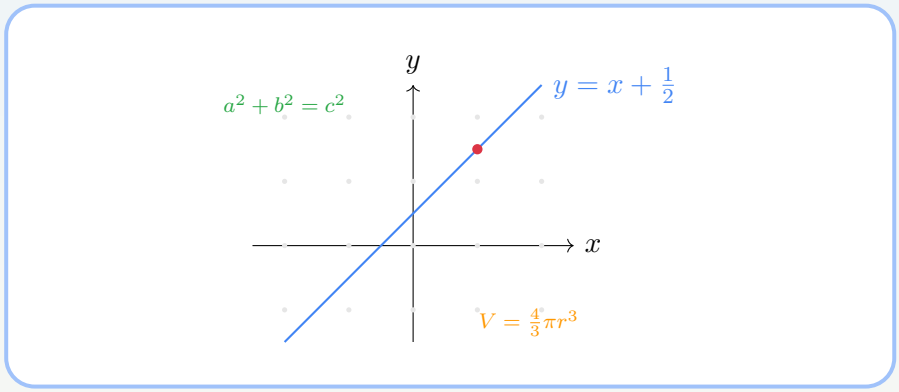
MADE RIDICULOUSLY SIMPLE

THE ULTIMATE STUDY GUIDE TO ACE ALGEBRA I

North Dakota Algebra I

Made Ridiculously Simple

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



Reza Nazari

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9-10.AR.11	Add, subtract, and multiply polynomials.
9-10.AR.F.1	Determine whether a relationship is a function given a table, graph, or words, identifying x as an element of the domain and f(x) as an element in the range. Determine the domain and range of a function in context.
9-10.AR.F.2	Use function notation, evaluate functions for inputs in their domains and interpret statements that use function notation in context.
9-10.AR.F.3	Sketch the key features (to include intercepts, maximums, minimums, and lines of symmetry, where applicable) of linear, exponential, and quadratic functions modeling the relationship between two quantities using tables, graphs, written descriptions, and equations.
9-10.AR.F.4	Relate the domain of a linear, quadratic, or exponential function to its graph and, where applicable, to the quantitative relationship it describes.
9-10.AR.F.5	Calculate and interpret the rate of change of linear, quadratic, or exponential functions (presented algebraically or as a table) over specified intervals. Estimate the rate of change from a graph.
9-10.AR.F.7	Compare key features of two linear, exponential, or quadratic functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
9-10.AR.F.11	Interpret the parameters in a linear, quadratic, or exponential function in context.
9-10.AR.F.12	Identify, using graphs or tables, the solution(s) to linear and exponential functions $f(x) = g(x)$ as x-value(s) that result in equivalent y-values.
9-10.AR.F.6.a	Use appropriate forms of linear, quadratic, and exponential functions to show zeros, extreme values, and symmetry (where applicable) and interpret them in context.
9-10.AR.F.6.b	Use the properties of an exponential function to classify it as growth or decay.
9-10.DPS.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
9-10.DPS.2	Compare the center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets using statistics appropriate to the shape of the data distribution.
9-10.DPS.4	Distinguish between correlation and causation.
9-10.DPS.3.a	Fit a linear function to the data (with or without technology) if appropriate.

9-10.DPS.3.b	Compute (using technology) and interpret the correlation coefficient of a linear fit.
9-10.DPS.3.c	Interpret the meaning of the slope and y-intercept of the linear model in context.
9-10.NO.1	Explain how the definition of rational exponents follows from extending the properties of integer exponents; rewrite simple expressions involving radicals and rational exponents using the properties of exponents.
9-10.NO.4	Define appropriate quantities and units for the purpose of descriptive modeling.
9-10.NO.5	Choose a level of accuracy or precision appropriate to limitations on measurement when reporting quantities.

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1.4 Introduction to Equations and Solutions

9-10.AR.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" $\rightarrow =$.

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

1.5 Personal Financial Literacy

9-10.NO.4 | 9-10.NO.5

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.

Examples

① You deposit \$500 in an account that earns 4% simple interest per year. How much interest do you earn in 3 years? What is the total amount?

Use $I = Prt$: $I = 500 \times 0.04 \times 3 = 60$. Total amount $A = 500 + 60 = 560$.

Answer: *Interest* = \$60; *Total* = \$560

② You invest \$1,000 at 5% interest compounded annually. What is the balance after 2 years?

Use $A = P(1 + r)^t$ with $P = 1000$, $r = 0.05$, $t = 2$: $A = 1000(1.05)^2 = 1000(1.1025) = 1102.50$.

Answer: \$1,102.50

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