ALABAMA ACAP



ALGEBRA I

MADE RIDICULOUSLY SIMPLE

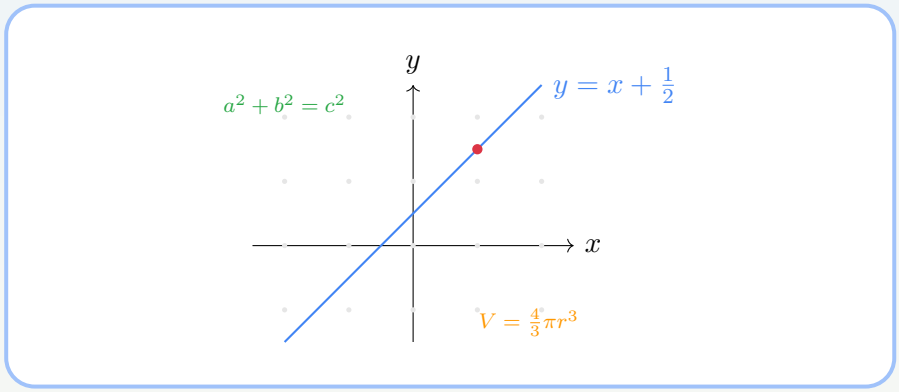
THE ULTIMATE STUDY GUIDE TO ACE ALGEBRA I

$y = mx + b$ $a^2 + b^2 = c^2$ x^2 y $(x+y)$ x $(a-b)^2$ $=$ $\sqrt{x}$ $x-y$ y^2 $x+y=z$ $2x-3=7$ $x^2+y^2=r^2$ $m=\frac{y_2-y_1}{x_2-x_1}$

Alabama ACAP Algebra I

Made Ridiculously Simple

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



Reza Nazari

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8 Explain why extraneous solutions can arise in absolute value equations and how to check candidate solutions.

9 Select an appropriate method to solve a quadratic equation in one variable, including inspection, square roots, completing the square, the quadratic formula, and factoring, while recognizing when solutions are not real.

10 Select an appropriate method to solve a system of two linear equations in two variables, including linear combinations, substitution, graphing, and tables.

11 Create equations and inequalities in one variable and use them to solve contextual problems, exactly or approximately, involving linear, quadratic, exponential, and absolute value relationships.

12 Create equations in two or more variables to represent contextual relationships; graph equations with labels and scales and use them to make predictions for linear, quadratic, exponential, absolute value, and linear piecewise contexts.

13 Represent constraints with equations and/or inequalities, solve systems, and interpret solutions as viable or nonviable in modeling contexts involving linear, quadratic, exponential, absolute value, and linear piecewise functions.

14 Given a relation defined by an equation in two variables, identify its graph as the set of all solutions plotted in the coordinate plane.

15 Define a function as a mapping from a domain to a range, use function notation, evaluate functions, interpret function notation in context, and relate domain to graphs and quantitative relationships.

16 Compare relations and functions represented by equations, graphs, or tables; determine whether a relation is a function; and explain that $y = f(x)$ is a special kind of relation.

17 Combine standard functions using arithmetic operations and composition to write, evaluate, and interpret functions in context, limited to linear, quadratic, exponential, and absolute value functions.

18 Solve systems consisting of linear and/or quadratic equations in two variables graphically, using technology when appropriate.

19 Explain why x-coordinates of intersections of $y = f(x)$ and $y = g(x)$ solve $f(x) = g(x)$, and find approximate solutions graphically, with tables, or with technology.

20 Graph solutions to linear inequalities in two variables as half-planes and graph systems of linear inequalities as intersections of half-planes.

21 Compare properties of two functions represented in different ways, including linear, quadratic, exponential, absolute value, and general piecewise functions.

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22 Define sequences as functions with domains that are subsets of the integers, and write explicit and recursive formulas for arithmetic and geometric sequences connected to linear and exponential functions.

23 Identify the effects on graphs of transformations such as $f(x)+k$, $kf(x)$, $f(kx)$, and $f(x+k)$, and find k from graphs for linear, quadratic, exponential, absolute value, and linear piecewise functions.

24 Distinguish linear and exponential situations, including equal differences versus equal factors, constant rate per unit interval, and constant percent growth or decay per unit interval.

25 Construct linear and exponential functions, including arithmetic and geometric sequences, from graphs, descriptions, or two input-output pairs.

26 Use graphs and tables to show that exponential growth eventually exceeds linear or quadratic growth.

27 Interpret parameters of linear functions in the form $mx+b$ and exponential functions in the form ab^x in context.

28 For a function that models a relationship, interpret key features of graphs and tables and sketch graphs showing key features for linear, quadratic, exponential, absolute value, and linear piecewise functions.

29 Calculate and interpret the average rate of change of a function over an interval, and estimate rate of change from a graph.

30 Graph functions expressed symbolically and show key features, including linear and quadratic intercepts, maxima and minima, piecewise and absolute value behavior, and exponential intercepts and end behavior.

31 Use the mathematical modeling cycle to solve real-world problems involving linear, quadratic, exponential, absolute value, and linear piecewise functions.

34 Distinguish between quantitative and categorical data and between the techniques used to analyze each type.

35 Analyze possible association between two categorical variables using two-way frequency tables, segmented bar graphs, relative frequencies, and trends.

36 Generate two-way categorical tables to find and evaluate solutions to real-world problems, including aggregated data and situations involving Simpson's Paradox.

37 Describe events as subsets of a sample space using characteristics, categories, unions, intersections, or complements.

39 Compute conditional probability $P(A \mid B)$ using two-way tables or tree diagrams.

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1.4 Introduction to Equations and Solutions

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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

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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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