VIRGINIA SOL



ALGEBRA I

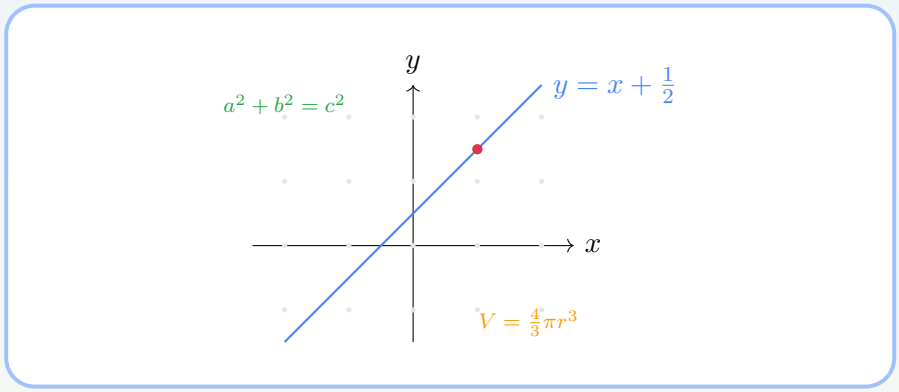
MADE RIDICULOUSLY SIMPLE

THE ULTIMATE STUDY GUIDE TO ACE ALGEBRA I

Virginia SOL Algebra I

Made Ridiculously Simple

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



Reza Nazari

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A.EI.2.a	Create a system of two linear equations in two variables to represent a contextual situation.
A.EI.2.b	Apply the properties of real numbers and/or properties of equality to solve a system of two linear equations in two variables, algebraically and graphically.
A.EI.2.c	Determine whether a system of two linear equations has one solution, no solution, or an infinite number of solutions.
A.EI.3.a	Solve a quadratic equation in one variable over the set of real numbers with rational or irrational solutions, including those that can be used to solve contextual problems.
A.EI.3.b	Determine and justify if a quadratic equation in one variable has no real solutions, one real solution, or two real solutions.
A.EI.3.c	Verify possible solution(s) to a quadratic equation in one variable algebraically, graphically, and with technology to justify the reasonableness of answer(s). Explain the solution method and interpret solutions for problems given in context.
A.EO.1.a	Translate between verbal quantitative situations and algebraic expressions, including contextual situations.
A.EO.2.b	Determine the product of polynomial expressions in one variable, using a variety of strategies, including concrete objects and their related pictorial and symbolic models, the application of the distributive property, and the use of area models. The factors should be limited to five or fewer terms.
A.EO.2.c	Factor completely first- and second-degree polynomials in one variable with integral coefficients. After factoring out the greatest common factor (GCF), leading coefficients should have no more than four factors.
A.EO.2.d	Determine the quotient of polynomials, using a monomial or binomial divisor, or a completely factored divisor.
A.EO.2.e	Represent and demonstrate equality of quadratic expressions in different forms.
A.EO.3.a	Derive the laws of exponents through explorations of patterns, to include products, quotients, and powers of bases.
A.EO.4.d	Generate equivalent numerical expressions and justify their equivalency for radicals using rational exponents, limited to rational exponents of 1/2 and 1/3.
A.F.1.a	Determine and identify the domain, range, zeros, slope, and intercepts of a linear function, presented algebraically or graphically, including the interpretation of these characteristics in contextual situations.
A.F.1.b	Investigate and explain how transformations to the parent function y = x affects the rate of change (slope) and the y-intercept of a linear function.

A.F.1.c	Write equivalent algebraic forms of linear functions, including slope-intercept form, standard form, and point-slope form, and analyze and interpret the information revealed by each form.
A.F.1.d	Write the equation of a linear function to model a linear relationship between two quantities, including those that can represent contextual situations. Writing the equation of a linear function will include the following situations: given the graph of a line; given two points on the line whose coordinates are integers; given the slope and a point on the line whose coordinates are integers; vertical lines as x = a; and horizontal lines as y = c.
A.F.1.f	Graph a linear function in two variables, with and without the use of technology, including those that can represent contextual situations.
A.F.1.g	For any value, x, in the domain of f, determine f(x), and determine x given any value f(x) in the range of f, given an algebraic or graphical representation of a linear function.
A.F.1.h	Compare and contrast the characteristics of linear functions represented algebraically, graphically, in tables, and in contextual situations.
A.F.2.c	Graph a quadratic function, f(x), in two variables using a variety of strategies, including transformations f(x) + k and kf(x), where k is limited to rational values.
A.F.2.d	Make connections between the algebraic (standard and factored forms) and graphical representation of a quadratic function.
A.F.2.g	For any value, x, in the domain of f, determine f(x) of a quadratic or exponential function. Determine x given any value f(x) in the range of f of a quadratic function. Explain the meaning of x and f(x) in context.
A.ST.1.a	Formulate investigative questions that require the collection or acquisition of bivariate data.
A.ST.1.c	Determine an appropriate method to collect a representative sample, which could include a simple random sample, to answer an investigative question.
A.ST.1.g	Investigate and explain the meaning of the rate of change (slope) and y-intercept (constant term) of a linear model in context.
A.ST.1.i	Make conclusions based on the analysis of a set of bivariate data and communicate the results.

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1.4 Introduction to Equations and Solutions

A.EI.1.a | A.EI.1.c | A.EI.1.e

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

A.ST.1.c

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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