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Arkansas Algebra I Practice Workbook

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The Most Comprehensive Review of Algebra I

By

Reza Nazari

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Domain: Seeing Structure in Expressions

Cluster(s): 3. Interpret the structure of expressions

4. Write expressions in equivalent forms to solve problems

HSA.SSE.A.1	3	Interpret *expressions* that represent a quantity in terms of its context* • Interpret parts of an *expression* using appropriate vocabulary, such as *terms*, *factors*, and *coefficients* • Interpret complicated *expressions* by viewing one or more of their parts as a single entity For example: Interpret $P(1 + r)^n$ as the product of P and a factor not depending on P.
HSA.SSE.A.2	3	Use the structure of an *expression* to identify ways to rewrite it For example: See that $(x + 3)(x + 3)$ is the same as $(x + 3)^2$ or $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. Limitation: i) Tasks are limited to numerical expressions and polynomial expressions in one variable. ii) Examples: Recognize $53^2 - 47^2$ as a difference of squares and see an opportunity to rewrite it in the easier-to-evaluate form $(53 + 47)(53 - 47)$. See an opportunity to rewrite $a^2 + 9a + 14$ as $(a + 7)(a + 2)$.
HSA.SSE.B.3	4	Choose and produce an equivalent form of an *expression* to reveal and explain properties of the quantity represented by the *expression** • Factor a quadratic expression to reveal the *zeros* of the function it defines • Complete the square in a quadratic expression to reveal the *maximum* or *minimum* value of the function it defines Note: Students should be able to identify and use various forms of a quadratic expression to solve problems. o Standard Form: $ax^2 + bx + c$ o Factored Form: $a(x - r_1)(x - r_2)$ o Vertex Form: $a(x - h)^2 + k$ Limitation: i) Tasks have a real-world context. As described in the standard, there is an interplay between the mathematical structure of the expression and the structure of the situation such that choosing and producing an equivalent form of the expression reveals something about the situation. ii) Tasks are limited to exponential expressions with integer exponents.

Domain: Arithmetic with Polynomials and Rational Expressions

Cluster(s): 5. Perform arithmetic operations on polynomials

6. Understand the relationship between zeros and factors of polynomials

7. Use polynomial identities to solve problems

8. Rewrite rational expressions

HSA.APR.A.1	5	• Add, subtract, and multiply *polynomials* • Understand that *polynomials*, like the integers, are closed under addition, subtraction, and multiplication Note: If p and q are polynomials $p + q$, $p - q$, and pq are also polynomials.
HSA.APR.B.3	6	• Identify *zeros* of *polynomials* (linear, quadratic only) when suitable factorizations are available • Use the *zeros* to construct a rough graph of the function defined by the *polynomial*
HSA.APR.C.4	7	Prove polynomial identities and use them to describe numerical relationships Note: Examples of Polynomial Identities may include but are not limited to the following: • $(a + b)^2 = a^2 + 2ab + b^2$ (Algebra 1) • $a^2 - b^2 = (a - b)(a + b)$ (Algebra 1)
HSA.APR.D.7	8	• Add, subtract, multiply, and divide by nonzero rational expressions • Understand that rational expressions, like the integers, are closed under addition, subtraction, and multiplication

Domain: Creating Equations*

Cluster(s): 9. Create equations that describe numbers or relationships

HSA.CED.A.1	9	Create *equations* and *inequalities* in one *variable* and use them to solve problems Note: Including but not limited to *equations* arising from: • *Linear functions* • *Quadratic functions* • *Exponential functions* • *Absolute value functions*
HSA.CED.A.2	9	• Create *equations* in two or more *variables* to represent relationships between quantities • Graph equations, in two *variables*, on a *coordinate plane*
HSA.CED.A.3	9	• Represent and interpret constraints by *equations* or *inequalities*, and by *systems of equations* and/or *inequalities* • Interpret solutions as viable or nonviable options in a modeling and/or real-world context
HSA.CED.A.4	9	Rearrange *literal equations* using the properties of equality

Domain: Reasoning with Equations and Inequalities
Cluster(s): 10. Understand solving equations as a process of reasoning and explain the reasoning
11. Solve equations and inequalities in one variable
12. Solve systems of equations and inequalities graphically
13. Solve systems of equations

HSA.REI.A.1	10	Assuming that *equations* have a solution, construct a solution and justify the reasoning used Note: Students are not required to use only one procedure to solve problems nor are they required to show each step of the process. Students should be able to justify their solution in their own words. (limited to quadratics)
HSA.REI.A.2	10	Solve simple rational and radical equations in one *variable*, and give examples showing how *extraneous solutions* may arise For example: The area of a square equals 49 square inches. The length of the side is 7 inches. Although -7 is a solution to the equation, $x^2 = 49$, *-7* is an extraneous solution.
HSA.REI.B.3	11	Solve linear equations, inequalities and *absolute value equations* in one *variable*, including *equations* with *coefficients* represented by letters
HSA.REI.B.4	11	Solve quadratic equations in one *variable* • 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 Note: This would be a good opportunity to demonstrate/explore how the quadratic formula is derived. This standard also connects to the transformations of *functions* and identifying key features of a graph (F-BF3). Introduce this with a leading coefficient of 1 in Algebra I. Finish mastery in Algebra II. • Solve quadratic equations (as appropriate to the initial form of the equation) by: o Inspection of a graph o Taking square roots o Completing the square o Using the quadratic formula o Factoring Recognize complex solutions and write them as $a \pm bi$ for real numbers a and b (Algebra 2 only) Limitation:i) Tasks do not require students to write solutions for quadratic equations that have roots with nonzero imaginary parts. However, tasks can require the student to recognize cases in which a quadratic equation has no real solutions. Note: Solving a quadratic equation by factoring relies on the connection between *zeros* and *factors* of polynomials (cluster A-APR.B). Cluster A-APR.B is formally assessed in Algebra II.

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