Task Background
Domain & Area: Mathematics - Algebra
Target CCR Standard(s) (including level of standard, if needed) and/or adult diploma competency for Algebra**:** **Algebra (MN K-12 Academic Standards:** ABE instruction in Levels D and E covering Algebra (Demonstrated competency mastery in all Level D standards and at least one Level E standard in the CCRS for Algebra). **CCRS Algebra Level D standards** 1. Use properties of operations to generate equivalent expressions. a. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. (7.EE.1) b. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05." (7.EE.2) [Also see A.SSE.2, A.SSE.3, A.SSE.3a, A.CED.4] 2. Solve real-life and mathematical problems using numerical and algebraic expressions and equations. a. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. (7.EE.3)* b. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (7.EE.4) [Also see A.CED.1 and A.REI.3] ● Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width? (7.EE.4a) [Also see A.CED.1 and A.REI.3]

- Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions. (7.EE.4b) [Also see A.CED.1 and A.REI.3]

3. Work with radicals and integer exponents.
    a. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, 32 × 3 (–5) = 3(–3) = (1/3)3 = 1/27. (8.EE.1) [Also see F.IF.8b]*
    b. Use square root and cube root symbols to represent solutions to equations of the form x 2 = p and x 3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (8.EE.2) [Also see A.REI.2]
    c. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

For example, estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109 , and determine that the world population is more than 20 times larger. (8.EE.3)

    d. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. (8.EE.4) [Also see N.Q.3]

4. Understand the connections between proportional relationships, lines, and linear equations.
    a. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. (8.EE.5) [Also see 7.RP.2b]

5. Analyze and solve linear equations and pairs of simultaneous linear equations.
    a. Solve linear equations in one variable. (8.EE.7) [Also see A.REI.3]
        - Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). (8.EE.7a)
        - Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. (8.EE.7b)
    b. Analyze and solve pairs of simultaneous linear equations. (8.EE.8)
        - Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. (8.EE.8a)
        - Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the

equations. Solve simple cases by inspection.

For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. (8.EE.8b) [Also see A.REI.6]

- Solve real-world and mathematical problems leading to two linear equations in two variables.

For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair. (8.EE.8c)

6. Define, evaluate, and compare functions.
    a. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.22 (8.F.1) [Also see F.IF.1] 22 Function notation is not required at this level.
    b. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. (8.F.3)

7. Use functions to model relationships between quantities.
    a. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. (8.F.4) [Also see F.BF.1 and F.LE.5]
    b. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. (8.F.5) [Also see A.REI.10 and F.IF.7]

CCRS Algebra Level E standard

Perform arithmetic operations on polynomials. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. (A.APR.1) [Note from panel: Emphasis should be on operations with polynomials.]

Task Description: The purpose of this task is for a student to demonstrate knowledge in algebra, exhibiting knowledge meeting level D and E standards.

Information for the Teacher

- All materials described below are found in a Google Doc here: https://drive.google.com/drive/folders/1Xe4gGfNinaNtrKf0r-jLngd9-piQZNlx?usp=sharing

- Student should complete capstone after completing ABE curriculum or achieving knowledge through other accepted means.The student should have already been introduced to the concepts of algebra and be able to complete problems at level D and level E.
- This task was designed to be completed independently by a learner in an appropriate, quiet testing environment. For learners needing more support, teachers can break up the task into sections, and have the student complete each section individually after providing review, practice and corrections.
- There is an answer key provided for the task. Criteria: Student will achieve a score of 80% or higher overall, and 80% or higher for Level E problems. If a student does not meet mastery scores, additional instruction and replacement problems in the specific standard will be provided.
- Include the following items when submitting this task as evidence for the diploma portfolio:
    - Completed Standard Adult High School Diploma Cover Sheet
    - Graded Student Capstone Assignment

Activities	
Title: Algebra Capstone	**Materials:** This activity includes the capstone document and the capstone answer key.