



CUNY Elementary Algebra Final Exam

**List of Learning Objectives
August 2012**

CUNY Elementary Algebra Proficiency Standards Details As amended 3/30/2012

The letters and numbers in parentheses correspond to statements from the NYC Department of Education's Integrated Algebra details by Strand. An asterisk (*) indicates the statement was modified to reflect a significant difference.

Pre-Algebra Prerequisites. These are assumed foundations.

- a) Perform the four basic binary operations with rational numbers represented as fractions or decimals including signed numbers.
- b) Understand and determine the order relations $<$, $>$, $=$ of real numbers.
- c) Properly apply the order of operations (only whole number exponents).
- d) Understand how to compute the absolute value of real numbers.
- e) Find the areas and/or perimeters of polygons (triangles, rectangles, squares, trapezoids) and circles.

TOPICS/LEARNING OBJECTIVES THAT WILL BE TESTED ON THE UNIFORM FINAL EXAM

These topics are not sequentially ordered according to dependencies or suggested sequencing.

1) Operations

- a. Radicals. Includes only square roots of nonnegative *numbers*.
 - i. Simplify radical terms (no variable in the radicand). (AN2)
 - ii. Perform addition, subtraction, multiplication and division using like and unlike radical terms and express the result in simplest form. (AN3*)
 1. Multiplication should involve at most one factor of the form $a + b\sqrt{d}$ with $a \neq 0$.
 2. All divisors and denominators should be of the form $a + b\sqrt{d}$ with $a = 0$.
- b. Scientific Notation
 - i. Convert between standard decimal and scientific notation.
 - ii. Understand and use scientific notation to compute products and quotients of numbers. (AN4)
- c. Exponents. Multiply and divide monomial expressions with a common base using the properties of exponents. All exponents are integral. (AA12)

2) Variables and Expressions

- a. Translate a quantitative verbal phrase into an algebraic expression. (AA1)
- b. Add and subtract monomials and polynomials. (AA13*)
- c. Multiplication of a monomial and binomial by any degree polynomial. (AA13*)
- d. Divide a polynomial by a monomial, where the quotient has no remainder. (AA14*)
- e. Factoring
 - i. Identify and factor the greatest common factor from an algebraic expression.
 - ii. Identify and factor the difference of two perfect squares. (AA19)

- iii. Factor all trinomials of a single variable, including a leading coefficient other than 1.
- iv. Factor algebraic expressions by grouping with up to 4 terms, possibly with multiple variables.
- v. Factor algebraic expressions completely where the factorization requires more than one step (e.g. first remove the GCF and then factor the remaining factor). (AA20*)

3) Equations and Inequalities

- a. Translate verbal sentences into mathematical equations. (AA4)
 - b. Solve all types of linear equations in one variable. (AA22)
 - c. Systems of Linear Equations (2x2) †
 - i. Solve systems of two linear equations in two variables algebraically. (AA10)
 - ii. Graph and solve systems of linear equations with rational coefficients in two variables. (AG7*)
 - † **Note:** On a multiple choice exam it is impossible to impose a solution method on students. As a result, we will combine these two objectives into a single test item and assume students may use either method when answering the question.
 - d. Solve literal equations for a given variable. (AA23) (Area and perimeter formulas should be included as one source of examples.)
 - e. Quadratic Equations:
 - i. Understand and apply the multiplication property of zero to solve quadratic equations with integral coefficients. (AA27*)
 - ii. Solve quadratic equations with no linear term.
 - iii. Determine the measure of a third side of a right triangle using the Pythagorean Theorem, given the lengths of any two sides. (AA45)
 - f. Linear inequalities in a single variable
 - i. Solve linear inequalities in one variable. (AA24)
 - ii. Represent solutions to linear inequalities as a single inequality.
 - iii. Represent the solution to a linear inequality in one variable on a number line.
- 4) Functions and functional notation. This is an introduction to basic notational representation and should not include any explicit discussion of functions vs. relations, domain, range and vertical line test, etc.
- a. Use function notation to compute a single output for simple linear and quadratic relationships.

5) Coordinate Geometry

- a. Slope and equations of a line
 - i. Determine the slope of a line, given the coordinates of two points on the line. (AA33)
 - ii. Write the equation of a line, given its slope and the coordinates of a point on the line. (AA34)
 - iii. Write the equation of a line, given the coordinates of two points on the line. (AA35)
 - iv. Write the equation of a line parallel to the x - or y -axis. (AA36)
 - v. Determine the slope and y -intercept of a line, given its equation in any form. (AA37*)
 - vi. Write and transform equations of lines in the following forms
 1. Point-Slope form
 2. Slope Intercept form
 3. $Ax + By = C$ form
- b. Draw and recognize graphs of lines.

6) Proportions and percent

- a. Solve simple verbal problem with two quantities that are proportional.
- b. Solve simple verbal problem involving a single percent and/or a single percent increase/decrease.