

## Algebra standards: Book A

### Calculate rates

**A.PA.06.01** Solve applied problems involving rates, including speed, e.g., if a car is going 50 mph, how far will it go in  $3\frac{1}{2}$  hours?

### Understand the coordinate plane

**A.RP.06.02** Plot ordered pairs of integers and use ordered pairs of integers to identify points in all four quadrants of the coordinate plane.

### Use variables, write expressions and equations, and combine like terms

**A.FO.06.03** Use letters, with units, to represent quantities in a variety of contexts, e.g., y lbs., k minutes, x cookies.

**A.FO.06.04** Distinguish between an algebraic expression and an equation.

**A.FO.06.05** Use standard conventions for writing algebraic expressions, e.g.,  $2x + 1$  means "two times x, plus 1" and  $2(x + 1)$  means "two times the quantity (x + 1)."

**A.FO.06.06** Represent information given in words using algebraic expressions and equations.

**A.FO.06.07** Simplify expressions of the first degree by combining like terms, and evaluate using specific values.

### Represent linear functions using tables, equations, and graphs

**A.RP.06.08** Understand that relationships between quantities can be suggested by graphs and tables.

**A.PA.06.09** Solve problems involving linear functions whose input values are integers; write the equation; graph the resulting ordered pairs of integers, e.g., given c chairs, the "leg function" is  $4c$ ; if you have 5 chairs, how many legs?; if you have 12 legs, how many chairs?

**A.RP.06.10** Represent simple relationships between quantities using verbal descriptions, formulas or equations, tables, and graphs, e.g., perimeter-side relationship for a square, distance-time graphs, and conversions such as feet to inches.

**Solve equations**

**A.FO.06.11** Relate simple linear equations with integer coefficients, e.g.,  $3x = 8$  or  $x + 5 = 10$ , to particular contexts and solve.

**A.FO.06.12** Understand that adding or subtracting the same number to both sides of an equation creates a new equation that has the same solution.

**A.FO.06.13** Understand that multiplying or dividing both sides of an equation by the same non-zero number creates a new equation that has the same solutions.

**A.FO.06.14** Solve equations of the form  $ax + b = c$ , e.g.,  $3x + 8 = 15$  by hand for positive integer coefficients less than 20, use calculators otherwise, and interpret the results.

## Algebra GLCEs standards: Book B

### Understand and apply directly proportional relationships and relate to linear relationships

**A.PA.07.01** Recognize when information given in a table, graph, or formula suggests a directly proportional or linear relationship.

**A.RP.07.02** Represent directly proportional and linear relationships using verbal descriptions, tables, graphs, and formulas, and translate among these representations.

**A.PA.07.03** Given a directly proportional or other linear situation, graph and interpret the slope and intercept(s) in terms of the original situation; evaluate  $y = mx + b$  for specific  $x$  values, e.g., weight vs. volume of water, base cost plus cost per unit.

**A.PA.07.04** For directly proportional or linear situations, solve applied problems using graphs and equations, e.g., the heights and volume of a container with uniform cross-section; height of water in a tank being filled at a constant rate; degrees Celsius and degrees Fahrenheit; distance and time under constant speed.

**A.PA.07.05** Recognize and use directly proportional relationships of the form  $y = mx$ , and distinguish from linear relationships of the form  $y = mx + b$ ,  $b$  non-zero; understand that in a directly proportional relationship between two quantities one quantity is a constant multiple of the other quantity.

### Understand and represent linear functions

**A.PA.07.06** Calculate the slope from the graph of a linear function as the ratio of "rise/run" for a pair of points on the graph, and express the answer as a fraction and a decimal; understand that linear functions have slope that is a constant rate of change.

**A.PA.07.07** Represent linear functions in the form  $y = x + b$ ,  $y = mx$ , and  $y = mx + b$ , and graph, interpreting slope and  $y$ -intercept.

**A.FO.07.08** Find and interpret the  $x$  and/or  $y$  intercepts of a linear equation or function. Know that the solution to a linear equation of the form  $ax + b = 0$  corresponds to the point at which the graph of  $y = ax + b$  crosses the  $x$  axis.

**Understand and solve problems about inversely proportional relationships**

**A.PA.07.09** Recognize inversely proportional relationships in contextual situations; know that quantities are inversely proportional if their product is constant, e.g., the length and width of a rectangle with fixed area, and that an inversely proportional relationship is of the form  $y = k/x$  where  $k$  is some non-zero number.

**A.RP.07.10** Know that the graph of  $y = k/x$  is not a line, know its shape, and know that it crosses neither the  $x$  nor the  $y$ -axis.

**Apply basic properties of real numbers in algebraic contexts**

**A.PA.07.11** Understand and use basic properties of real numbers: additive and multiplicative identities, additive and multiplicative inverses, commutativity, associativity, and the distributive property of multiplication over addition.

**Combine algebraic expressions and solve equations**

**A.FO.07.12** Add, subtract, and multiply simple algebraic expressions of the first degree, e.g.,  $(92x + 8y) - 5x + y$ , or  $x(x+2)$  and justify using properties of real numbers.

**A.FO.07.13** From applied situations, generate and solve linear equations of the form  $ax + b = c$  and  $ax + b = cx + d$ , and interpret solutions.

## Algebra standards: Book C

### Understand the concept of non-linear functions using basic examples

**A.RP.08.01** Identify and represent linear functions, quadratic functions, and other simple functions including inversely proportional relationships ( $y = k/x$ ); cubics ( $y = ax^3$ ); roots ( $y = \sqrt{x}$ ); and exponentials ( $y = a^x$ ,  $a > 0$ ); using tables, graphs, and equations.

**A.PA.08.02** For basic functions, e.g., simple quadratics, direct and indirect variation, and population growth, describe how changes in one variable affect the others.

**A.PA.08.03** Recognize basic functions in problem context, e.g., area of a circle is  $\pi r^2$ , volume of a sphere is  $\frac{4}{3}\pi r^3$ , and represent them using tables, graphs, and formulas.

**A.RP.08.04** Use the vertical line test to determine if a graph represents a function in one variable.

### Understand and represent quadratic functions

**A.RP.08.05** Relate quadratic functions in factored form and vertex form to their graphs, and vice versa; in particular, note that solutions of a quadratic equation are the x-intercepts of the corresponding quadratic function.

**A.RP.08.06** Graph factorable quadratic functions, finding where the graph intersects the x-axis and the coordinates of the vertex; use words "parabola" and "roots"; include functions in vertex form and those with leading coefficient -1, e.g.,  $y = x^2 - 36$ ,  $y = (x - 2)^2 - 9$ ;  $y = -x^2$ ;  $y = -(x - 3)^2$ .

### Recognize, represent, and apply common formulas

**A.FO.08.07** Recognize and apply the common formulas:

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(a + b)(a - b) = a^2 - b^2$$
; represent geometrically.

**A.FO.08.08** Factor simple quadratic expressions with integer coefficients, e.g.,  $x^2 + 6x + 9$ ,  $x^2 + 2x - 3$ , and  $x^2 - 4$ ; solve simple quadratic equations, e.g.,  $x^2 = 16$  or  $x^2 = 5$  (by taking square roots);  $x^2 - x - 6 = 0$ ,  $x^2 - 2x = 15$  (by factoring); verify solutions by evaluation.

**A.FO.08.09** Solve applied problems involving simple quadratic equations.

**Understand solutions and solve equations, simultaneous equations, and linear inequalities**

**A.FO.08.10** Understand that to solve the equation  $f(x) = g(x)$  means to find all values of  $x$  for which the equation is true, e.g., determine whether a given value, or values from a given set, is a solution of an equation (0 is a solution of  $3x^2 + 2 = 4x + 2$ , but 1 is not a solution).

**A.FO.08.11** Solve simultaneous linear equations in two variables by graphing, by substitution, and by linear combination; estimate solutions using graphs; include examples with no solutions and infinitely many solutions.

**A.FO.08.12** Solve linear inequalities in one and two variables, and graph the solution sets.

**A.FO.08.13** Set up and solve applied problems involving simultaneous linear equations and linear inequalities.