CAISL
Carlucci American International School of Lisbon

GRADE 10 ALGEBRA 2 FRAMEWORK

Contents

EXPECTATIONS

MATH TOOLS

To support curriculum implementation, the Common Core recommends the use of certain math tools at each grade level. CAISL implements these recommendations, with the exception of a graphing calculator, which CAISL chooses to introduce in High School.

MENTAL MATH

To reinforce computational fluency, students are expected to practice mental math calculations based on grade level content on a weekly basis.

INFORMATION TECHNOLOGY EXPECTATIONS

Students will be expected to use a variety of digital tools according to grade level expectations stated in CAISL's Research and Information Technology Integration Scope and Sequence.
See link below:
https://www.caislisbon.org/uploaded/Curriculum_links/2019-2020/IT_Skills_Scope_and_Sequence_by_Grade.pdf

PERFORMANCE INDICATORS

MATH PRACTICES

Explanations of Math Practices: By the end of the year students will be expected to problem solve, reason mathematically, and communicate efficiently according to grade level expectations. See link below:

https://www.caislisbon.org/uploaded/Curriculum_links/Math/Math_Practice_Progressions_5-12.pdf

PROBLEM SOLVING

Make sense of problems and persevere in solving them
Look for and make use of structure (Deductive Reasoning)
Look for and express regularity in repeated reasoning (Inductive Reasoning)
Reason abstractly and quantitatively
Construct viable arguments and critique the reasoning of others
Model with mathematics
Use appropriate tools strategically
Attend to precision

MATH CONCEPTS

NUMBER AND QUANTITY

Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. DOK 2 E
Rewrite expressions involving radicals and rational exponents using the properties of exponents. DOK 2 E
Use matrices to represent and manipulate data. DOK 2 E
Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. DOK 2 E
Add, subtract, and multiply matrices of appropriate dimensions. DOK 2 E
Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. DOK 3 E
Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. DOK 3 E
Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors. DOK 2
Work with 2 × 2 matrices as a transformation of the plane, and interpret the absolute value of the determinant in terms of area. DOK 2

ALGEBRA

Interpret expressions that represent a quantity in terms of its context. DOK 3 E
Use the structure of an expression to identify ways to rewrite it. DOK 2 E
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. DOK 2 E

Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. DOK 3 E
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. DOK 3
Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x - a is p(a), so p(a) = 0 if and only if (x - a) is a factor of p(x). DOK 2
Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. DOK 2
Prove polynomial identities and use them to describe numerical relationships. DOK 2
Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle. DOK 2 E
Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system. DOK 2
Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. DOK1
Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational functions. DOK 2 E
Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. DOK 2 E
Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. DOK 2
Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. DOK 2 E
Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. DOK 3
Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. DOK 2 E
Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. DOK 2E
Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. DOK 2 E
Represent a system of linear equations as a single matrix equation in a vector variable. DOK 2 E
Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater). DOK 2

FUNCTIONS

Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). DOK1 E
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. DOK 2 E
Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. DOK1 E
Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. DOK1 E
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. DOK 2 E

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. DOK 2 E
Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. DOK 2 E
Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. DOK 2
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. DOK 3 E
Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. DOK 2 E
Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). DOK 2 E
For exponential models, express as a logarithm the solution to ab^{ct}= d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. DOK 2

GEOMETRY

Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. DOK 2 E
Derive the equation of a parabola given a focus and directrix. DOK4 E
Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. DOK 3 E

FURTHER CURRICULAR EXPECTATIONS

For the Performance Indicator (Seeing Structure in Expressions):
Interpret expressions that represent a quantity in terms of its context

- Interpret parts of an expression, such as terms, factors and coefficients.
- Interpret complicated expressions by viewing one or more of their parts as a single entity.

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.
- Use the properties of exponents to transform expressions for exponential functions.

For the Performance Indicator (Interpreting Functions):
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph polynomial functions, identifying zeros when suitable factorizations are available.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

- Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
- Use the properties of exponents to interpret expressions for exponential functions.

Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

For the Performance Indicator (Building Functions):
Write a function that describes a relationship between two quantities.

- Compose functions.