

21st Century Learning Mathematics Standard
J.O. Combs Unified School District #44
High School: Honors Algebra 2 w/Trigonometry

Honors Algebra 2 with Trigonometry explores advanced algebraic concepts at a more extensive breadth, depth, and pace than in Algebra 2. Trigonometry concepts are introduced and developed. Each topic is studied with emphasis on conceptual understanding, graphical representation and applications through the creation of mathematical models. This rigorous course is designed to prepare students who excel in mathematics for future honors and AP courses.

1. LINEAR FUNCTIONS

- HALG2.1.1 Solves linear systems of equations with three equations and three variables.
- HALG2.1.2 Solves linear systems of inequalities (required: three or more inequalities).
- HALG2.1.3 Defines the variables, sets up, solves and analyzes system application problems (required: linear programming, mixture, distance=rate*time).

2. ABSOLUTE VALUE FUNCTIONS

- HALG2.2.1 Graphs absolute value functions (required: $f(x) = \pm a|\pm b(x - h)| + k$).
- HALG2.2.2 Graphs and solves absolute value inequalities (required: $f(x) \leq \pm a|\pm b(x - h)| + k$).
- HALG2.2.3 Writes the equation of an absolute value function given the graph.

3. CHARACTERISTICS OF FUNCTIONS

- HALG2.3.1 Evaluates a function using function notation (required: numeric and algebraic).
- HALG2.3.2 Performs operation on functions (required: addition, subtraction, multiplication, division, and composition).
- HALG2.3.3 Finds the inverse function (required: domain restrictions).
- HALG2.3.4 Finds the average rate of change given a nonlinear graph, equation, or critical information.

4. GRAPHING QUADRATIC FUNCTIONS

- HALG2.4.1 Adds, subtracts, multiplies, and divides complex numbers.
- HALG2.4.2 Solves quadratic equations (required: by extracting the square root, the quadratic formula, factoring, completing the square).
- HALG2.4.3 Graphs quadratic functions (required: standard form, factored form, and $f(x) = \pm a(x - h)^2 + k$).
- HALG2.4.4 Graphs piecewise functions (required: quadratic and linear functions).

5. APPLICATION OF QUADRATIC FUNCTIONS

- HALG2.5.1 Writes the equation of a quadratic (required: vertex and a point, x intercepts and a point).
- HALG2.5.2 Defines the variables, sets up, solves and analyzes quadratic application problems (required: position function).
- HALG2.5.3 Finds the average rate of change given a nonlinear graph, equation, or critical information.
- HALG2.5.4 Approximates the instantaneous rate of change at a given point.

6. SOLVING POLYNOMIAL FUNCTIONS

- HALG2.6.1 Rewrites polynomial expressions to equivalent forms (required: adding, subtracting, multiplying and dividing polynomial expressions, and factoring).
- HALG2.6.2 Solves polynomial equations (required: factoring, rational root theorem).

7. APPLICATION OF POLYNOMIAL FUNCTIONS

- HALG2.7.1 Graphs polynomial functions (required: factored form, standard form, and vertex form $f(x) = \pm a(x - h)^n + k$).
- HALG2.7.2 Writes the equation of a polynomial given the zeroes and the leading coefficient (required: complex zeros).

8. RADICAL FUNCTIONS

- HALG2.8.1 Simplifies radical expressions to equivalent forms (required: adding, subtracting, multiplying and dividing radical expressions).
- HALG2.8.2 Solves radical equations (required: rational exponents).
- HALG2.8.3 Graphs square root and cube root functions (required: $f(x) = \pm a\sqrt{\pm bx - h} + k$).

9. GRAPHING RATIONAL FUNCTIONS

- HALG2.9.1 Simplifies rational expressions (required: adding, subtracting, multiplying and dividing rational expressions).
- HALG2.9.2 Solves rational equations.
- HALG2.9.3 Graphs rational functions (required: horizontal and slant asymptotes, removable discontinuities).

10. APPLICATION OF RATIONAL FUNCTIONS

- HALG2.10.1 Writes an equation that fits the model of a rational pattern (required: removable discontinuity).
- HALG2.10.2 Defines the variables, sets up, solves, and analyzes direct and inverse (indirect) variation application problems (required: rational exponents).

11. GRAPHING EXPONENTIAL FUNCTIONS

- HALG2.11.1 Uses the properties of exponents (required: rational exponents).
- HALG2.11.2 Solves exponential equations.
- HALG2.11.3 Graphs exponential equations (required: $f(x) = \pm a \cdot b^{\pm(x-h)} + k$).

12. APPLICATION OF EXPONENTIAL FUNCTIONS

- HALG2.12.1 Writes the equation of an exponential function.
- HALG2.12.2 Defines the variables, sets up, solves and analyzes exponential application problems (required: growth, decay, half/double life, continuously compounded interest, and compounded interest).

13. SIMPLIFYING LOGARITHMIC EXPRESSIONS

- HALG2.13.1 Evaluates logarithmic expressions ($\log_2 4$).
- HALG2.13.2 Condenses and expands logarithmic expressions.
- HALG2.13.3 Rewrites expressions in equivalent forms (required: exponential and logarithmic form).

14. SOLVING AND GRAPHING LOGARITHMIC FUNCTIONS

- HALG2.14.1 Solves logarithmic equations.
- HALG2.14.2 Graphs logarithmic functions (required: $f(x) = \pm a \log_b[\pm c(x - h)] + k$).

15. CONICS

- HALG2.15.1 Graphs conic sections (required: circles, parabolas in the form of $\pm 4p(x - h) = (y - k)^2$ and $\pm 4p(y - k) = (x - h)^2$, ellipses, and hyperbolas from standard and h k form).
- HALG2.15.2 Writes the equation of a conic section given critical information (required: circles, ellipses, hyperbolas, and ellipses).

16. CIRCLES

- HALG2.16.1 Converts between radian measure and degree measure.
- HALG2.16.2 Sketches angles in radian measure.
- HALG2.16.3 Finds the arc length.
- HALG2.16.4 Finds the reference angle.

17. SEQUENCES AND SERIES

- HALG2.17.1 Determines the type and the n th term of a sequence (required: arithmetic and geometric).
- HALG2.17.2 Evaluates a finite and infinite geometric series.
- HALG2.17.3 Evaluates a finite arithmetic sum.
- HALG2.17.4 Evaluates a finite sum in summation notation.
- HALG2.17.5 Evaluates a sum using the summation formulas (required: a constant, i, i^2).

18. REASONING

- HALG2.18.1 Simplifies trigonometric expressions (required: half angle, double angle, sum and difference, Pythagorean identities, reciprocal identities, quotient identities, cofunction identities, even and odd identities).
- HALG2.18.2 Evaluates trigonometric expressions (required: half angle, double angle, sum and difference, reciprocal identities, quotient identities, cofunction identities, even and odd identities).
- HALG2.18.3 Verifies trigonometric identities (required: half angle, double angle, sum and difference, Pythagorean identities, reciprocal identities, quotient identities, cofunction identities, even and odd identities, 2-column proof format).

19. GRAPHING TRIGONOMETRIC FUNCTIONS

- HALG2.19.1 Graphs all six trigonometric functions with transformations (for example: $f(x) = \pm a \sin[\pm b(x - c)] + d$).
- HALG2.19.2 Describes the graphs of the arcsine, arccosine, and arctangent functions, giving domain and range.

20. SOLUTIONS OF TRIGONOMETRIC FUNCTIONS

- HALG2.20.1 Solves trigonometric equations (required: with and without domain restrictions).
- HALG2.20.2 Solves inverse trigonometric equations (required: unit circle angle solutions, and calculator approximations, inverse cosecant, secant, and cotangent equations).

21. INVERSE TRIGONOMETRIC EXPRESSIONS

- HALG2.21.1 Evaluates inverse trigonometric expressions.
- HALG2.21.2 Simplifies and evaluates the composition of trigonometric and inverse trigonometric expressions.

22. WRITING TRIGONOMETRIC EQUATIONS

- HALG2.22.1 Writes the equation of any transformed periodic function (required: given the graph, critical information).

23. APPLICATION OF TRIGONOMETRIC RELATIONSHIPS

- HALG2.23.1 Solves application problems of right and oblique triangles (required: bearings).
- HALG2.23.2 Finds the area of right and oblique triangles.
- HALG2.23.3 Defines the variables, sets up an equation, and analyzes a trigonometric equation from an application problem.
- HALG2.23.4 Analyzes an application problem given trigonometric equation.