Algebraic Connections

Algebraic Connections is a course designed for students who wish to increase their mathematical knowledge and skills prior to enrollment in the Algebra II course or the Algebra II with Trigonometry course. Algebraic Connections expands upon the concepts of Algebra I and Geometry, with an emphasis on application-based problems. This course provides opportunities to incorporate the use of technology through its emphasis on applying functions to make predictions and to calculate outcomes. The prerequisites for Algebraic Connections are Algebra I and Geometry.

Students will:

ALGEBRA

Modeling

1. Create algebraic models for application-based problems by developing and solving equations and inequalities, including those involving direct, inverse, and joint variation.

    Example: The amount of sales tax on a new car is directly proportional to the purchase price of the car. If the sales tax on a $20,500 car is $1,600, what is the purchase price of a new car that has a sales tax of $3,200?
    Answer: The purchase price of the new car is $41,000.

2. Solve application-based problems by developing and solving systems of linear equations and inequalities.

3. Use formulas or equations of functions to calculate outcomes of exceptional growth or decay.

    Example: Solve problems involving compound interest, bacterial growth, carbon-14 dating, and depreciation.

4. 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-APR1)

Graphing

5. Determine maximum and minimum values of a function using linear programming procedures.

    Example: Observe the boundaries $x \geq 0$, $y \geq 0$, $2x - 3y + 15 \geq 0$, and $x \leq 9$ to find the maximum and minimum values of $f(x,y) = 3x + 5y$.

6. Determine approximate rates of change of nonlinear relationships from graphical and numerical data.

    a. Create graphical representations from tables, equations, or classroom-generated data to model consumer costs and to predict future outcomes.

7. Use the extreme value of a given quadratic function to solve applied problems.

    Example: Determine the selling price needed to maximize profit.

Finance

8. Use analytical, numerical, and graphical methods to make financial and economic decisions, including those involving banking and investments, insurance, personal budgets, credit purchases, recreation, and deceptive and fraudulent pricing and advertising.

    Examples: Determine the best choice of certificates of deposit, savings accounts, checking accounts, or loans. Compare the costs of fixed – or variable-rate mortgage loans. Compare costs associated with various credit cards. Determine the best cellular telephone plan for a budget.

    a. Create, manually or with technological tools, graphs and tables related to personal finance and economics.

        Example: Use spreadsheets to create an amortization table for a mortgage loan or a circle graph for a personal budget.

Functions

9. Use function notation, evaluate functions for inputs in their domains, and interpret statement that use function notation in terms of context. (F-IF1)

GEOMETRY

Modeling

10. Determine missing information in an application-based situation using properties of right triangles, including trigonometric ratios and the Pythagorean Theorem.

    Example: Use a construction or landscape problem to apply trigonometric ratios and the Pythagorean Theorem.

Symmetry

11. Analyze aesthetics of physical models for line symmetry, rotational symmetry, or the golden ratio.

    Example: Identify the symmetry found in nature, art, or architecture.

Measurement

12. Critique measurements in terms of precision, accuracy, and approximate error.

      Example: Determine whether one candidate as a significant lead over another candidate when given their current standings in a poll and the margin of error.

13. Use ratios of perimeters, areas, and volumes of similar figures to solve applied problems.

      Example: Use a blueprint or scale drawing of a house to determine the amount of carpet to be purchased.

STATISTICS AND PROBABLILITY

Graphing

14. Create a model of a set of data by estimating the equation of a curve of best fit from tables of values or scatter plots.

      Examples: Create models of election results as a function of population change, inflation or employment rate as a function of time, cholesterol density as a function of age or weight of a person.

    a. Predict probabilities given a frequency distribution.

Additional Content

15. Use GCF, difference of squares, perfect square trinomials, and grouping to factor binomials, trinomials, and other polynomials.

16. Analyze linear function from their equations of their characteristics, including slopes and intercepts.

    a. Determine equations of linear functions given two points, a point and a slope, tables of values, graphs, or ordered pairs.
    b. Graph two-variable linear equations and inequalities on the Cartesian plane.

17. Simplify numerical expression, including those involving square roots, radical form, and decimal approximations using properties of real numbers and order of operations.

18. Solve quadratic equations using the zero product property.

    a. Determine approximate solutions of quadratic equations graphically and numerically.
    b. Solve quadratic equations using the quadratic formula.
    c. Graph