Algebra is more than a set of procedures for manipulating symbols. Algebra provides a way to explore, analyze, and represent mathematical concepts and ideas. It can describe relationships that are purely mathematical or ones that arise in real-world phenomena and are modeled by algebraic expressions. Learning algebra helps students make connections in varied mathematical representations, mathematics topics, and disciplines that rely on mathematical relationships. Algebra offers a way to generalize mathematical ideas and relationships, which apply to a wide variety of mathematical and nonmathematical settings.

NCTM, Guiding Principles for Mathematics Curriculum and Assessment

Our goal is to use varying teaching/learning strategies in order to meet the needs of all the students and the demands of the content. These strategies include, but are not limited to, the following:

Give students a new type of problem and have students arrive at solutions individually or in groups. Then share with group to collect all the different ways to solve a problem.

Present a new problem and think, pair, share.

Give students a new type of problem together with a worked out solution and have students discover and explain, in writing and verbally, how and why the solution works.

Direct instruction – Typically direct instruction will follow some exploratory time for students to play around with a new type of problem/situation/scenario. Students' brainstorming will be the start of direct instruction, with notes and examples and information that help students make sense of the new problem and place it in the context of prior knowledge.

Have students analyze a new problem: what about it looks familiar, what about it looks new, how could they start the problem or, if they can't start, what might be involved while attacking the problem. Students share ideas in writing and verbally.

Have students use technology (graphing calculators, Geometer's Sketchpad, Graphmatica, etc) to explore functions and mathematical concepts.

Have students reflect on their learning in writing and verbally. A regular class wrap up will include asking students to write what they learned in the day's work, what questions they still have, what it reminds them of from past work, and other associations they have with the new material.

Expose students to complex problems that involve many concepts and lend themselves to a variety of solutions and strategies. These could be problems that take anywhere from 15 minutes to an hour to multiple days to solve.

Instructional goals

Nurture an appreciation for the distinct nature of mathematics as an abstract language system that is internally consistent and understood through rigorous analytical thinking skills.

Nurture an appreciation for how the analytical thinking and problem solving skills honed in mathematics is essential for students' current and future lives regardless of whether they choose a mathematical or scientific field.

Wherever possible, tie the mathematical content to other fields such as economics, literature, all the sciences, psychology, politics, etc., so that students can see the relevance and use of mathematics in other contexts.

Nurture numeracy and statistical savvy so that students may be critical consumers of statistical information in their current and future lives.

A constant goal is to achieve depth of understanding and connection, despite a much too full list of topics prescribed by the State of New York.

Nurture mathematical reasoning and analytical skills and the ways to express one's reasoning, both verbally and in writing. We want to encourage students to look for and recognize patterns, internal structure, regularities or irregularities both in "real-world" problems and in the symbolic language of mathematics. We want students to see when patterns are meaningful as opposed to when they are by chance or accidental. We want students to justify their solutions and to see why those solutions make sense.

Assessment

We plan to use both formal and informal assessments to ascertain understanding. Assessments will also be both formative and summative.

Projects – research and writing projects, statistics projects that involve gathering and analyzing data, solving and explaining solutions to complex, multi-faceted problems

Tests and quizzes

Group work – group work allows the teacher to circulate and listen in, thus giving the teacher an idea of student understanding and misconceptions.

Written descriptions of solutions to problems – students will be asked to describe their process for solving a particular problem in writing, which will give the teacher an insight into student understanding of the method being assessed.

Homework

We hope to train students to make homework a productive, reflective process. Homework is a time to practice problem solving skills and thinking processes. By providing solutions, we hope to encourage students to check their own work and work independently to find their own mistakes and identify any misunderstandings or gaps in knowledge.

New Paltz Central School District
Integrated Algebra

Unit 1: Number Theory

Essential Questions:

1. How is the study of set theory related to other disciplines?
2. Why is scientific notation important to science?
3. What kind of data would you use to represent absolute value?

Time	Perform Ind	Content	Lessons	Vocabulary
Sept. (3 weeks)	A.A.29	Use set builder notation and /or interval notation to illustrate the elements of a set, given the elements in roster form.	**1**: Set Theory Set Builder notation Roster Notation Complement, Intersection, Union	Multiplicative Inverse/Identity Reciprocal
	A.A.30	Find the complement of a subset of a given set, within a given universe.	**2**: Evaluate Expressions • Scientific Notation o Product o Quotient • Absolute value • Exponents	Rational Irrational Radical Approximation Set Subset Union Intersection Complement Element Empty Set
	A.A. 31	Find the intersection of sets (no more than three sets) and/or union of sets (no more than three sets).		
	A.N.2	Simplify radical terms **(no variable in radicand).**	**3**: Simplify Radicals **(no variables)** **4**: Multiply/Divide Radicals **5**: Add/Subtract Radicals	
	A.N.3	Perform the four arithmetic operations using like and unlike radical terms and express the result in simplest form.	**6**: Radicals-All Operations **(HW: integrated unit practice)**	
	A.N.4	Understand and use scientific notation to compute products and quotients of numbers.	**7**: Assessment	
	A.N.6	Evaluate expressions involving factorial(s), and exponential expression(s)	(applications are taught throughout the lessons)	

New Paltz Central School District
Integrated Algebra

Unit 2: Algebraic Expressions

Essential Questions:

1. Why do we need to convert expressions to algebraic expressions?
2. How are multiplication and division related to finding the area and volume of different geometric shapes?

Time	Perform Ind	Content	Lessons	Vocabulary
October (3 weeks)	A.A.1	Translate a quantitative verbal phrase into an algebraic expression.	**1:** Combine Like Terms • Add/Subtract Monomials and Polynomials **2:** Multiply Polynomials • Distribution **3:** Divide Polynomials **4:** All Operations of Polynomials **5:** Applications **6:** Assessment (Unit test) **(Translate Verbal Expressions is integrated within each lesson)**	Simplify Coefficient Monomial Binomial Trinomial Polynomial Like Terms
	A.A.2	Write a verbal expression that matches a given mathematical expression.		
	A.A.3	Distinguish the difference between an algebraic expression and an algebraic equation.		
	A.A .12	Multiply and divide monomial expressions with a common base, using the properties of exponents. Note: Use integral exponents only.		
	A.A.13	Add, subtract, and multiply monomials and polynomials.		
	A.A.14	Divide a polynomial by a monomial or binomial, where the quotient has no reminder.		

New Paltz Central School District
Integrated Algebra

Unit 3: Linear Equations and Inequalities in One Variable

Essential Questions:

1. How can percents describe growth over time?
2. What strategies can be used to solve word problems?

Time	Perform Ind	Content	Lessons	Vocabulary
Oct.-Nov. (3 weeks)	A.A.4	Translate verbal sentences into mathematical equations or inequalities.	**1:** Solving Equations • Combine like terms • Distribute • Variables on both sides	Inverse Operation Percent Increase Percent Decrease Discount Sales Tax Rate Consecutive Even Integer Consecutive Odd Integer Direct Variation
	A.A.5	Write algebraic equations or inequalities that represent a situation.		
	A.A.22	Solve all types of linear equations in one variable.	**2:** Solving Equations with Fractions • Multiply by LCD • Proportions	
	A.A .25	Solve equations involving fractional expressions. **Note**: Expressions which result in linear equations in one variable.	**3:** Solving Inequalities • Graph on number lines	
	A.A.6	Analyze and solve verbal problems whose solution requires solving a linear equation in one variable or linear inequality in one variable.	**4:** Word Problems • Solve Literal Equations	
	A.A.23	Solve literal equations for a given variable (incl. formulas).	• Percents • Percent Change • Discount • Fractions	
	A.A.26	Solve algebraic proportions in one variable which results in linear equations.		
	A.A.21	Determine whether a given value is a solution to a given linear equation in one variable or linear inequality in one variable.	**5:** Word Problems • Consecutive Integers • Motion	
	A.N.5	Solve algebraic problems arising from situations that involve fractions, decimals, percents (decrease/increase and discount) , and proportionality/direct variation.	**6:** Word Problems • Money • Age	
	8.A.14	Solve linear inequalities by combining like terms, using the distributive property, or moving variable to one side of the inequality (including multiplication or division of inequalities by negative numbers).	**7:** Word Problems • Mixed Practice	
	A.A.24	Solve linear inequalities in one variable.	**8:** Assessment	
	8.G.19	Graph the solution set of an inequality on a number line.		
	8.G.13	Solve multi-step inequalities and graph the solution set on a number line.		

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Integrated Algebra

Unit 4: Applied Mathematics and /or Right Triangle Relationships

Essential Questions:

1. Why do we use units in measurement?
2. How do measurements help compare objects?
3. How are non-standard units used to measure objects?
4. How can trig be used?
5. Why do we use trig? and when?

Time	Perform Ind	Content	Lessons	Vocabulary
Nov.-Dec. (3 weeks)	A.M.1	Calculate rates using appropriate units.	**1:** Formulas • Perimeter • Area • Shaded Area o (**Sectors of circles)**	Angle of Elevation Angle of Depression Sine Cosine Tangent Adjacent Opposite Hypotenuse Sector Quarter-circle Semi-circle
	A.M.2	Solve problems involving conversions within measurement systems, given the relationship between the units.	**2:** Formulas • Volume • Surface Area • Calculate relative error	
	A.G.1	Find the area and/or perimeter of figures composed of polygons, and circles, or sectors of a circle.	**3:** Pythagorean Theorem • Triples • Application to Area and Perimeter	
	A.G.2	Use formulas to calculate volume and surface area of rectangular solids and cylinders.		
	A.M.3	Calculate the relative error of measuring square and cubic units, when there is an error in the linear measure.	**4:** Trig Ratios • Identify • Set-up ratios **5:** Trig Ratios • Solve ratios • Applications	
	A.A.42	Find the sine, cosine, and tangent ratios of an angle of a right triangle, given the lengths of the sides.	**6:** Applications **7:** Assessment **Note: Dimensional Analysis included in applications**	
	A.A.43	Determine the measure of an angle of a right triangle, given the lengths of any two sides of the triangle.		
	A.A.44	Find the measure of the side of a right triangle, given an acute angle and the length of another side.		
	A.A.45	Determine the measure of a third side of a right triangle using the Pythagorean Theorem, given the lengths of any two sides.		

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Unit 5: Factoring and Rational Expressions

Essential Questions:

1. What strategies can be used to multiply and divide algebraic fractions?
2. How is factoring related to quadratic functions?

Time	Perform Ind	Content	Lessons	Vocabulary
Dec.-Jan. (4 weeks)	A.A.19	Identify and factor the difference of two perfect squares.	**1:** Factoring • GCF • DOPS	Perfect Square Greatest Common Factor
	A.A.20	Factor algebraic expression completely, including trinomials with a lead coefficient of one (after factoring a GCF).	**2:** Factoring • Trinomials (a=1) • Trinomial with GCF	Undefined Standard Form
	A.A.15	Find values of a variable for which an algebraic fraction is undefined.	**3:** Algebraic Fractions • Undefined • Simplify	
	A.A .16	Simplify fractions with polynomials in the numerator and denominator by factoring both and renaming them to lowest terms.	**4:** Add/Subtract Algebraic Fractions • Monomials • Like Binomials	
	A.A.17	Add or subtract fractional expressions with monomial or like binomial denominators.	**5:** Multiply/Divide Algebraic Fractions	
	A.A.18	Multiply and divide algebraic fractions and express the product or quotient in simplest form.	**6:** Assessment: (Factoring only) ***(Note: after holiday break: finish fractions and another assessment)** **7:** Algebraic Fractions **8:** Applications **9:** *Assessment (Unit Test) Midterm Assessment	

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Unit 6: Linear Equations and Inequalities in Two Variables

Essential Questions:

1. How can linear relationships be used to make decisions? (Decide, Show, Predict, Describe….)
2. How can we use linear equations to solve real-life situations?
3. How does slope represent a rate of change?

Time	Perform Ind	Content	Lessons	Vocabulary
Jan.-Feb. (3 weeks)	A.S.2	Determine whether the data to be analyzed is univariate or bivariate.	**1:** Linear Equations • Intro. y=mx+b • Put EQ. into standard form • Solutions	Abscissa Ordinate Slope
	A.S.12	Identify the relationship between the independent and dependent variables from a scatter plot of bivariate data.	**2:** Graphing y=mx+b • Identify the types of Slope	Linear Equation X and Y intercepts Correlation
	A.S.7	Create a scatter plot of bivariate data.	• Slope (graphically-rise over run) • Slope: rate of change • Parallel lines to x and y axis • Graph y=mx+b lines	Causation Line of Best Fit Univariate Bivariate Independent Dependent variables
	A.S.17	Use a reasonable line of best fit to make a prediction involving interpolation or extrapolation.	**3:** Graphing y=mx+b • Effect of Coefficients(discovery)	Parallel Perpendicular
	A.S.13	Understand the difference between correlation and causation.	• Parallel and Perpendicular Lines	
	A.S.14	Identify variables that might have a correlation but not a causal relationship.	• Graph all types of lines	
	A.G.3	Determine when a relationship is a function, by examining ordered pairs and inspecting graphs of relations.	**4:** Writing Linear Equations • Slope and given point	
	8.G.13	Determine the slope of a line from a graph and explain the meaning of a slope as a constant rate of change.	• Two given points • Slope and y-intercept • Parallel and Perpendicular Lines	
	A.A.32	Explain slope as a rate of change between dependent and independent variables.	**5:** Graph Linear Inequalities	
	8.G.15	Graph a line using a table of values.	**6:** Scatter Plot • Sketch Line of Best Fit • Write the equation • Make Predictions	

	A.G.4	Identify and graph linear equations.	**7:** Applications **8:** Assessment **Note: Slope project**	
	8.G.17	Graph a line from an equation in slope-intercept form (y=mx+b).		
	8.G.16	Determine the equation of a line given the slope and y-intercept.		
	A.G.5	Investigate and generalize how changing the coefficients of a function affects its graph.		
	A.A.36	Write the equation of a line parallel to the x- or y-axis.		
	8.G.14	Determine the y-intercept of a line from a graph and be able to explain the y-intercept.		
	A.A.39	Determine whether a given point is on a line, given the equation of the line.		
	A.A.33	Determine the slope of a line, given the coordinates of two points on the line.		
	A.A.37	Determine the slope of a line, given its equation in any form.		
	A.A.38	Determine if two lines are parallel given their equations in any form.		
	A.A.34	Write the equation of a line, given its slope and the coordinates of a point on the line.		
	A.A.35	Write the equation of a line, given the coordinates of two points on the line.		
	A.S.8	Construct manually a reasonable line of best fit for a scatter plot and determine the equation of that line.		
	A.G.6	Graph linear inequalities.		

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Unit 7: Quadratic Equations and Functions

Essential Questions:

1. How can we use a graph of a quadratic equation to make a prediction?
2. How do architects use quadratics?
3. What is the connection between the roots of a quadratic equation and its factors?

Time	Perform Ind	Content	Lessons	Vocabulary
Feb.-Mar. (3 weeks)	8.G.20	Distinguish between linear and nonlinear equations (only graphically).	**1:** Solve Quadratic Equation Graphically • Effects of coefficients-discovery • Find vertex, axis of symmetry, roots	Axis of Symmetry Vertex (Max/Min) Roots Parabola
	8.G.21	Recognize the characteristics of quadratics in tables, graphs, equations, and situations.	**2:** Solve Quadratic Equation Graphically • Calculator • Table of Values • Write EQ. from graphic function	Calculator Terms
	A.G.4	Identify and graph quadratic functions.	**3:** Solve Quadratic Equation Algebraically • Get into standard form • Algebraic Proportions	Factorable Integral Roots
	A.A.27	Understand and apply the multiplication property of zero to solve quadratic equations with integral coefficient and integral roots.	**4:** Solve Algebraically • Contrast Graphically **5:** Word Problems	
	A.A.28	Understand the difference and connection between roots of a quadratic equation and factors of a quadratic equation.	**6:** Applications **7:** Assessment	
	A.A.26	Solve algebraic proportions in one variable which result in a quadratic equations.		
	A.A.41	Determine the vertex and axis of symmetry of a parabola, given its equation.		
	A.G.8	Find the roots of a parabolic function graphically. (Only quadratic equations with integral solutions).		
	A.G.10	Determine the vertex and axis of symmetry of a parabola, given its graph.		
	A.A.8	Analyze and solve verbal problems that involve quadratic equations.		

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Unit 8: Systems of Equations or Inequalities

Essential Questions:

1. How can the cost and revenue be described using systems of equations?
2. When would applications for systems of equations be valuable to use?

Time	Perform Ind	Content	Lessons	Vocabulary
Mar.-Apr. (3 weeks)	8.G.18	Solve systems of equations graphically (only linear, integral solutions, y=mx+b format, no vertical/horizontal lines).	**1:** Linear-Linear Systems Graphically • Equations and Inequalities • Word Problems **2:** Linear-Linear Systems Algebraically • Substitution • Word Problems **3:** Linear-Linear Systems Algebraically • Elimination • Word Problems **4:** Practice Linear Equation Problems **5:** Quadratic-Linear Systems • Graphically • Algebraically (Factorable Solutions Only) **6:** Applications **7:** Assessment	Point of Intersection Solution Set
	A.A.10	Solve systems of two linear equations in two variables algebraically.		
	A.A.7	Analyze and solve verbal problems whose solution requires solving systems of linear equations in two variables.		
	A.A.11	Solve a system of one linear and one quadratic equation in two variables, where only factoring is required. **Note: *The quadratic equation should represent a parabola and the solution(s) should be integers.***		
	A.G.9	Solve systems of linear and quadratic equations graphically. **Note: *Only use systems of linear and quadratic equations that lead to solutions whose coordinates are integers.***		
	A.G.7	Graph and solve systems of linear equations and inequalities with rational coefficients in two variables.		
	A.A.40	Determine whether a given point is in the solution set of a system of linear inequalities.		

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Unit 9: More Relations and Functions

Essential Questions:

1. How can we represent increase/decrease of populations with an exponential function?
2. Investigate and explore: What are other situations that will be best represented by an exponential function?

Time	Perform Ind	Content	Lessons	Vocabulary
Apr. (3 weeks)	8.A.18	Determine if a relation is a function.	**1:** Determine if a relation is a function • Graphically • Equation • Table of Values	Domain Range Relation Function Exponential Growth Decay
	8.A.17	Define and use correct terminology when referring to function (domain and range).	**2:** Graph Absolute Value Equations	
	8.A.19	Interpret multiple representations using equation, table of values, and graph.	**3:** Graph Exponential Functions	
	A.G.3	Determine when a relation is a function, by examining ordered pairs and inspecting graphs of functions.	**4:** Verbal Problems • Exponential Growth/Decay	
	A.G.4	Identify and graph absolute value and exponential functions.	**5:** Applications **6:** Assessment	
	A.A.9	Analyze and solve verbal problems that involve exponential growth and decay.		

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Unit 10: Probability

Essential Questions:

1. Why is probability important in sports?
2. How is probability used to make predictions?
3. Explore: How can using probability effect making decisions?

Time	Perform Ind	Content	Lessons	Vocabulary
May (3 weeks)	A.N.7	Determine the number of possible events, using counting techniques or the Fundamental Principle of Counting.	**1.** Single Event and Compound Events • Vocabulary • AND/OR/NOT	Certainty Complements Empirical Theoretical
	A.S.19	Determine the number of elements in a sample space and the number of favorable events.	**2:** Counting Principle • Sample Space • Tree Diagram	Factorial Mutually Exclusive Sample Space
	A.N.8	Determine the number of possible arrangements (permutations) of a list of items.	**3:** Probability • With/without replacement • Conditional probability	Permutations Combinations Dependent Event Independent Event
	A.S.18	Know the definition of conditional probability and use it to solve for probabilities in finite sample spaces.	**4:** Mixed Probability • Applications	Conditional probability
	A.S.20	Calculate the probability of an event and its complement.	**5:** Permutations • Factorials	
	A.S.21	Determine empirical probabilities based on specific sample data.	**6:** Applications **7:** Assessment	
	A.S.22	Determine, based on calculated probability of a set of events, if: > some or all are equally likely to occur > one is more likely to occur than another > whether or not an event is certain to happen or not to happen.		
	A.S.23	Calculate the probability of: > a series of independent events > a series of dependent events > two mutually exclusive events > two events that are not mutually exclusive.		

New Paltz Central School District
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Unit 11: Statistics

Essential Questions:

1. What are the similarities and differences among the measures of central tendency?
2. Analyze: How can a variety of graphs be used in business?

Time	Perform Ind	Content	Lessons	Vocabulary
June (3-4weeks)	A.S.10	Evaluate published reports and graphs that are based on data by considering: experimental design, appropriateness of the data analysis, and the soundness of the conclusions.	**1:** Mean, median, mode, range • Word Problems **2:** Histograms • Frequency Tables • Cumulative • Median intervals **3:** Construct Plots • Stem and Leaf • Box and Whisker **4:** Analyze graphs • Quartiles • Percentiles	Mean Median Mode Histogram Box-and-Whisker Plot Stem-and-Leaf Plot Quartile Percentile Outliers
	A.S.1	Categorize data as qualitative or quantitative.		
	A.S.3	Determine when collected data or display of data may be biased.	**5:** Analyze graphs • Read and Analyze Variety of Graphs • Qualitative/ • Quantitative Data • Identify Source of Bias	Univariate Bivariate Qualitative VS Quantitative
	A.S.15	Identify and describe sources of bias and its effect, drawing conclusion from data.	**6:** Applications	
	A.S.4	Compare and contrast the appropriateness of different measures of central tendency for a given data set.	**7**: Assessment: Regents Exam: Integrated Algebra	
	A.S.16	Recognize how linear transformations of one-variable data affect the data's mean, median, mode, and range.		
	A.S.5	Construct a histogram, cumulative frequency histogram, and a box-and-whisker plot, given a set of data.		

	A.S.9	Analyze and interpret a frequency distribution table or histogram, a cumulative frequency distribution table or histogram, or a box-and-whisker plot.		
	A.S.6	Understand how the five statistical summary (minimum, maximum, and the three quartiles) is used to construct a box-and-whisker plot.		
	A.S.11	Find the percentile rank of an item in a data set and identify the point values for the first, second, and third quartiles.		