Grade Level:	**Middle School/High School**
Class Title:	**Algebra**
Subject:	**Math**
Class Description:	This course will introduce students to the fundamentals of algebra. Algebra 1 is a full-year class that will include a study of operations on signed numbers, linear equations and inequalities, properties of polynomials, graphing linear equations and inequalities, and an introduction to absolute value. The second half of the course involves solving systems of equations, polynomials in more than one variable, radicals and radical expressions, rational algebraic expressions, and a brief introduction to quadratic equations. The foundations of algebra and its relationship to geometry will also be explored. An introduction to various principles of probability will be studied as well. This class will work toward one or more of the Washington State K-12 Learning Standards for Mathematics. This will be a year-long class, spanning the 2021-2022 school year. The estimated instructional hours for this class are ____per week.
Learning Materials:	List all materials.
Learning Goals/ Performance Objectives:	**Algebra Common Core Standards** Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★). **Interpret the structure of expressions** 1. Interpret expressions that represent a quantity in terms of its context.★ a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P*(1+*r*)n *as the product of P and a factor not depending on P.* 2. Use the structure of an expression to identify ways to rewrite it. *For example, see x*4 – *y*4 *as* (*x*2)2 – (*y*2)2, *thus recognizing it as a difference of squares that can be factored as* (*x*2 – *y*2)(*x*2 + *y*2). **Write expressions in equivalent forms to solve problems** 1. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★ a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression* 1.15t *can be rewritten as* (1.151/12)12*t* ≈ 1.01212t *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.* d. 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. *For example, calculate mortgage payments.*★

Perform arithmetic operations on polynomials

1. 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.

Understand the relationship between zeros and factors of polynomials

1. 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 $p(x)$.
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.

Use polynomial identities to solve problems

1. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x2 + y2)2 = (x2 – y2)2 + (2xy)2$ *can be used to generate Pythagorean triples.*

Rewrite rational expressions

1. 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.

Create equations that describe numbers or relationships

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
3. 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. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*

Understand solving equations as a process of reasoning and explain the reasoning

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Solve equations and inequalities in one variable

1. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
2. Solve quadratic equations in one variable.

a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)2 = q$ that has the same solutions. Derive the quadratic formula from this form.
b. Solve quadratic equations by inspection (e.g., for $x2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.
c. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

Solve systems of equations

1. 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.
2. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
3. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line* $y = –3x$ and the circle $x2 + y2 = 3$.

Represent and solve equations and inequalities graphically

1. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
2. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★
3. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).
2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize, represent, and interpret data on two categorical and quantitative variables

1. Summarize categorical data for two categories in two-way frequency tables.

Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

2. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
    a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*
    b. Informally assess the fit of a function by plotting and analyzing residuals.
    c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models

1. Interpret the slope (rate of change) and the intercept (constant term)of a linear model in the context of the data.
2. Compute (using technology) and interpret the correlation coefficient of a linear fit.
3. Distinguish between correlation and causation.

Understand and evaluate random processes underlying statistical experiments

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

1. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
2. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
3. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
4. Evaluate reports based on data.

Use the rules of probability to compute probabilities of compound events in a uniform probability model

1. Find the conditional probability of *A* given *B* as the fraction of *B*'soutcomes that also belong to *A,* and interpret the answer in terms of the model.
2. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.

Use and evaluate the accuracy of summary statistics to describe and compare data sets.

1. A univariate set of data identifies data on a single variable, such as shoe size.

2. This expectation extends what students have learned in earlier grades to include evaluation and justification. They both compute and evaluate the appropriateness of measure of center and spread (range and interquartile range) and use these measures to accurately compare data sets.
3. Students will draw appropriate conclusions through the use of statistical measures of center, frequency, and spread, combined with graphical displays.

Make valid inferences and draw conclusions based on data.

1. Determine whether arguments based on data confuse association with causation. Evaluate the reasonableness of and make judgments about statistical claims, reports, studies, and conclusions
    - Example: Mr. Shapiro found that the amount of time his students spent doing mathematics homework is positively correlated with test grades in his class. He concluded that doing homework makes students' test scores higher. Is this conclusion justified? Explain any flaws in Mr. Shapiro's reasoning.

Describe how linear transformations affect the center and spread of univariate data.

Find the equation of a linear function that best fits bivariate data that are linearly related, interpret the slope and y-intercept of the line, and use the equation to make predictions.

Describe the correlation of data in scatterplots in terms of strong or weak and positive or negative.

Sketch the graph for an exponential function of the form y = abn where n is an integer, describe the effects that changes in the parameters a and b have on the graph, and answer questions that arise in situations modeled by exponential functions.

Find and approximate solutions to exponential equations.

Express arithmetic and geometric sequences in both explicit and recursive forms, translate between the two forms, explain how rate of change is represented in each form, and use the forms to find specific terms in the sequence.

1. Write a recursive formula for the arithmetic sequence 5, 9, 13, 17, . . . What is the slope of the line that contains the points associated with these values and their position in the sequence? How is the slope of the line related to the sequence?
2. Given that u(0) = 3 and u(n + 1) = u(n) + 7 when n is a positive integer,
    - find u(5);
    - find n so that u(n) = 361; and
    - find a formula for u(n).
3. Write a recursive formula for the geometric sequence 5, 10, 20, 40, . . . and determine the 100th term.
4. Given that u(0) = 2 and u(n + 1) = 3u(n),
    - find u(4)
    - find a formula for u(n).

Solve an equation involving several variables by expressing one variable in terms of

	the others. 1. Solve A = p + prt for p. 2. Solve V = p r2 h for h or for r. A team of certificated teachers who are highly qualified in this subject matter has reviewed this WSLP.
Learning Activities:	Student will complete Study, Discussion, Activity and a Quiz for each section in a unit and then will complete a unit exam. Activities are based on a student earning a min. of 70% or better in each activity.
Progress Criteria/ Methods of Evaluation:	The student will cover all topics and be assessed with a variety of materials ranging from tests, quizzes, homework assignments, discussions, and frequent formative assessments. These assessments can be made by the parents and/or online tools. [Student's name] will keep a portfolio of weekly work samples and any written assessments to present to consultant at face-to-face meetings each month. Monthly assessments will be completed by the consultant/certified teacher. Monthly Progress will be marked satisfactory or unsatisfactory based on the professional judgment of the certified teacher using parent input, work samples, and monthly assessments.