

High School Mathematics

Algebra I

This course gives students a firm foundation in secondary mathematics. Topics covered include simplifying algebraic expressions, properties of real numbers, solving equations, graphing linear equations and inequalities, solving system of equations, powers and exponents, quadratic equations, polynomials and factoring, radicals and trig functions. Some lessons will include the use of a graphing calculator.

Learning Opportunities

Class discussion, group work, portfolio projects with real life applications, graphing calculator activities, CBR activities, pair shares, daily work, graph boards, Socratic method, note making, games and activities

Standards

Fields of Knowledge: Mathematics, Science, Technology

Mathematical Understanding

7.7 Geometric and Measurement Concepts: Students use geometric and measurement concepts.

7.8 Function and Algebra Concepts: Students use function and algebra concepts.

Mathematical Problem Solving and Reasoning

7.10 Applications: Students use concrete, formal and informal strategies to solve mathematical problems, apply the process of mathematical modeling, and extend and generalize mathematical concepts. Students apply mathematics as they solve scientific and technological problems or work with technological systems.

Content Knowledge and Skills

Connections to Algebra: numbers and number operations; exponents and powers; equations and inequalities, a problem-solving plan, variables in Algebra, orders of operations, verbal models and Algebraic models; exploring data: tables and graphs

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Rules of Algebra: the real number line, addition, subtraction, multiplication, and division of real numbers, the distributive property, exploring data; rates and ratios

Solving linear equations: solving equations using one, two, or more transformations; solving equations with variables on both sides; linear equations and problem solving; solving equations that involves decimals; literal equations and formulas; exploring data: scatter plots

Graphing linear equations: graphing linear equations in one variable; quick graphs using intercepts and slope-intercept form; graphs of absolute value equations; graphing linear equations in two variables; the slope of a line; solutions and x-intercepts; solving absolute value equations

Writing linear equations: equations of lines using slope intercept; equations of lines given two points; standard form of a linear equation; problem solving using linear models; equations of lines given the slope and a point; fitting a line to data; point-slope form of the equation of a line

Solving and graphing linear inequalities: solving inequalities in one variable; compound inequalities; graphing linear inequalities in two variables

Solving systems of linear equations: solving systems of linear equations, solving linear systems of graphing; solving linear systems by substitution; solving linear systems by linear combination; special types of linear systems; solving systems of linear inequalities

Powers and Exponents: multiplication properties of exponents, division properties of exponents, problem solving and scientific notation, negative and zero exponents, scientific notation, compound interest and exp. growth/decay.

Quadratic equations: square roots and the Pythagorean theorem, solving quadratic equations by using (square root), problem solving using the discriminant, graphing a quadratic equation, the quadratic formula, graphing quadratic inequalities

Polynomials and factoring: adding and subtracting polynomials, using the FOIL pattern, factoring quadratic trinomials, completing the square, multiplication of polynomials, factoring special products, solving quadratics by factoring

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Using proportions and rational equation: problem solving using proportions and ratios, direct and inverse variations, simplification of rational expressions, multiplying and dividing rational expressions, problem solving using percents, probability, dividing polynomials, solving rational equations

Functions: functions and relations, exponential functions, rational functions, stem-and-leaf and Box-and-whisker plots, linear functions, quadratic functions, measures of central tendency

Radicals and more connections to Geometry: the distance formula, operations with radicals, Trigonometry, simplifying radicals, solving radical equations

Assessment Criteria

Connections to Algebra

Students are able to:

represent numbers and number operations;
use grouping symbols;
evaluate variables expressions;
represent real-life quantities using variable expressions;
evaluate expression containing exponents;
use exponents in real-life problems;
use an established order of operations to evaluate algebraic expressions;
check and solve equations;
check solutions of inequalities;
translate verbal phrases into algebraic expressions;
translate verbal sentences into algebraic equations and inequalities;
use algebra to solve simple real-life problems; make an algebraic model for a real-life problem;
use tables to organize data;
use graphs to model data visually

Rules of Algebra

Students are able to:

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graph and compare real numbers;
find opposites and absolute values;
add real numbers;
subtract real numbers;
simplify the difference of two algebraic expressions;
multiply real numbers;
use the distributive property;
simplify expressions by combining like terms;
express division as multiplication;
divide real numbers;
use rates to relate quantities measured in different units;
use ratios to relate quantities measured in the same units.

Solving linear equations

Students are able to:

solve equations systematically using addition, subtraction, or division;
use reciprocals to solve equations;
collect variables on one side of an equations;
use algebraic models in real-life situations;
use a problem-solving plan for problems that fit a linear model;
find exact and approximate solutions for equations with decimals;
solve problems that use decimal measurements;
solve literal equations for a specified variable;
use a coordinate plane to match points with ordered pairs of numbers;
create and interpret a scatter plot

Graphing linear equations

Students are able to:

graph horizontal and vertical lines in the
coordinate plane;
use equations of horizontal and vertical lines in real-life settings;
graph a linear equation from a table of values;
interpret graphs of linear equations;
find the intercepts of the graph of a linear equation;
use intercepts to sketch a quick graph of a line;
find the slope of a line using two of its points;
interpret slope as a constant rate of change or an average rate of change;
find slope and y-intercept from an equation;
use the slope-intercept form to sketch a line and solve real-life problems;
use a graph as a quick check of a solution found algebraically;
approximate solutions of real-life problems by using a graph;
graph an absolute value equation;

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model a real-life situation using graphs of absolute value equations;
solve and check absolute value equations using algebra;
use a graph to check solutions of absolute value equations

Writing linear equations

Students are able to:

use the slope-intercept form to write an equation of a line;
model a real-life situation with a linear equation;
use slope and any point on a line to write an equation of the line;
model a real-life situation with a linear equation;
write an equation of a line given two points;
find a linear equation that approximates a set of data points;
use scatter plots to determine positive correlation, negative correlation, or no correlation;
transform a linear equation into standard form; model a real-life situation using the standard form of a linear equation;
use the point-slope form to write an equation of a line;
model a real-life situation using the point-slope form of a linear equation;
create and use linear models to solve problems;
make linear models that are accurate but simple to use

Solving and graphing linear inequalities

Students are able to:

graph linear inequalities in one variable;
solve linear inequalities in one variable;
write and use a linear inequality as a model for a real-life situation;
solve and graph compound inequalities;
model a real-life situation with a compound inequality;
solve absolute value inequalities;
model a real-life situation with an absolute value inequality;
graph a linear inequality in two variables;
model a real-life situation using a linear inequality in two variables;
draw and interpret visual models, such as time lines, picture graphs, and circle graphs

Solving systems of linear equations

Students will be able to:

solve a system of linear equations by graphing, substitution, and linear combination;
write and use a linear system as a real-life model;
identify a linear system that has many solutions;
visualize the solution possibilities for linear systems;

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use a graphing calculator to graph a linear system.

Powers and exponents:

Students are able to:

simplify exponential expressions using multiplication properties of exponents
simplify exponential expressions using properties of negative and zero exponents
simplify exponential expressions using division properties of exponents
use scientific notation to represent large and small numbers
use scientific notation in problem solving
use the exponential model to solve problems involving exponential growth, decay, and compound interest.

Quadratic equations:

Students are able to:

take square roots and use the Pythagorean Theorem
solve quadratic equations using inverse operations and the ac method,
graph quadratic equations using finding the vertex and roots
use the quadratic formula to solve and find the roots of a quadratic equation
graph quadratic inequalities
use quadratics to solve motion problems

Polynomials and factoring:

Students are able to:

add and subtract polynomials using properties of exponents
multiply polynomials using properties of exponents
multiply polynomials using FOIL pattern
use factoring to “undo” a polynomial
factor a Quadratic trinomial and solve
solve a Quadratic equation by completing the square

Using Proportions and Rational Equation:

Students are able to:

use cross multiplication to solve proportions
solve a variety of percentage problems
distinguish between a Direct and Inverse variation
solve a variety of problems involving data sets
simplify rational expressions using properties of exponents
multiply and divide rational expressions using properties of exponents
divide polynomial using properties of exponents
solve rational expressions using properties of algebra

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Functions:

Students are able to:

define a function

write linear functions given values for a function

graph exponential functions and use transformations on the graph

graph quadratic functions and how the constant effects the position of the graph

construct stem-and –leaf and box-and –whisker plots given data

find the mean, median, and mode given a data set

Radicals and more connections to Geometry:

Students will be able to:

calculate the distance between two points

simplify radical expressions using properties of Radicals

multiply, divide, add, and subtract radicals using properties of radicals

solve radical equations

use the tangent function to find the sides of a right triangle

Resources

Text: R.E. Larson, T.D.Kanold, and L. Stiff, *Algebra I*, (Lexington, Massachusetts/Toronto, Ontario: D.C. Heath and Company, 1993)