

Summary of Math Curriculum Topics

Sixth Grade

Arithmetic (75%)

<u>The World of Numbers</u>	Mental arithmetic & math tricks; casting out nines; exponents & roots; divisibility; prime factorization.
<u>Division</u>	Division and fractions; long division; why long division works; short division; checking answers.
<u>Fractions</u>	Thorough review; the relationship between fractions decimals & division; comparing fractions and decimals; compound fractions.
<u>Decimals</u>	Thorough review; converting between fractions and decimals; repeating decimals; converting repeating decimals to fractions.
<u>Business Math & Percents</u>	Introduction to percents; determining the percent of a given number; determining a percentage; percent increase and decrease; profit, commission & tax; simple interest; discount; loss; rate of pay; unit cost; temperature conversion formulas; business formulas; line graphs; pie charts.
<u>Other Topics</u>	Metric system; word problems (rates); statistics; introduction to ratios; significant digits; currency exchange rates.

Geometry (25%)

<u>General Concepts</u>	Circle & polygon terminology; angle measure; the three dimensions.
<u>The Basic Constructions</u>	Copying a line segment; copying an angle; bisecting a line segment; bisecting an angle; construction of perpendicular lines; construction of a parallel line; division of a line into equal parts; construction of regular polygons (square, hexagon, etc.).
<u>Spirals</u>	Equiangular spirals; the Archimedean spiral.
<u>Advanced Constructions</u>	Rotations of circles; the limaçon and the cardioid; the hierarchy of quadrilaterals; knot and interpenetrating polygons; the 24-division with all its diagonals; the King's Crown.
<u>Area</u>	Areas of rectangles, squares, and right triangles.

Math Main Lesson Blocks

1. Business Math (including percents, formulas, and graphing)
2. Geometry (geometric drawing)

Math Track Class meets three times per week (one of which is for “homework”)

Seventh Grade

Arithmetic (50%)

<u>The World of Numbers</u>	Mental arithmetic & math tricks; divisibility; roots.
<u>Measurement</u>	The metric system; review of the U.S. system.
<u>Percents</u>	Finding the base; strange percents; compound interest; calculating the percentage of increase or decrease.
<u>Ratios</u>	The three thoughts; the two forms; reciprocals of ratios ; proportion of the whole; similar figures; direct and inverse proportion.
<u>Irrational Numbers</u>	The ratio in a square; the ratio in a circle (π); repeating decimals; rational & irrational numbers; the square root algorithm (optional).
<u>Other Topics</u>	Puzzle problems with doubling; word problems (rates).

Algebra (20%)

<u>Basic Ideas</u>	Basic goals; the importance of form; an introductory puzzle; history; terminology.
<u>Negative Numbers</u>	A careful introduction; combining positive & negative numbers; rules for multiplication & division.
<u>Expressions</u>	Simplifying expressions.
<u>Formulas</u>	Gauss's summing formula; car rental formula; Galileo's law of falling bodies; Euclid's perfect number formula.
<u>Equations</u>	An equation as a puzzle; solving equations by <i>Guess and Check</i> ; the <i>Golden Rule of Equations</i> ; solving equations by balancing.
<u>Algebraic Word Problems</u>	An introduction to algebraic word problems.

Geometry (30%)

<u>Area</u>	The shear and stretch; areas of parallelograms, trapezoids, and non-right triangles.
<u>Geometric Drawing</u>	Geometric division; star patterns; triangle constructions (optional)
<u>The Pentagon & The Golden Ratio</u>	Construction and properties of the pentagon; the golden ratio; the golden rectangle & golden spiral; the golden triangle.
<u>Angle Theorems & Proofs</u>	Theorems arising from two parallel lines cut by a transversal; angles in a triangle add to 180° ; angles in other polygons; angle puzzles; Theorem of Morley; Theorem of Thales.
<u>The Pythagorean Theorem</u>	Visual proofs; Pythagorean triples; calculating missing sides of triangles.
<u>Other Topics</u>	Perspective drawing, various other drawing exercises.

Math Main Lesson Blocks

1. Algebra (Intro to the Basics – not too much!)
2. Geometry (geometric drawing, areas, theorems up to the Pythagorean Theorem)

Math Track Class meets four times per week (one of which is for “homework”)

Eighth Grade

Arithmetic (45%)

Number Bases

Ancient number systems; expanded decimal notation; scientific notation; octal; base-five; base-sixteen (hexadecimal); base-two (binary); arithmetic in various bases; converting between binary and hexadecimal.

The World of Numbers

Square root algorithm; Pythagorean Theorem.

Percents & Growth

Four ways to find the base; increase/decrease problems; exponential growth; the exponential growth formula; the rule of 72.

Dimensional Analysis

The two methods; Converting between metric and U.S. units; converting units for rates; converting areas and volumes; density.

Proportions

Shortcuts for solving (moving along diagonals, cross-multiplying); solving word problems with proportions; rate problems.

Algebra (10%)

Expressions

The laws of exponents; fractions & negatives.

Equations

Order of operations; evaluating expressions; distributive property; equations with fractions; “strange solutions”; converting repeating decimals into fractions.

Computers (5%)

Computer Memory & ASCII code

Bits and bytes; decoding binary codes.

Computer Algorithms

Writing algorithms using English; the prime number algorithm; an algorithm for addition; an algorithm for long division, the square root algorithm.

Geometry (40%)

Mensuration

Baravalle’s proof of the Pythagorean Theorem; area of a trapezoid; Heron’s formula; the area of four types of triangles; area of a circle; portions of circles; volume & surface area of solids (box, prism, pyramid, cylinder, cone, sphere, octahedron, tetrahedron); Archimedes’ ratio; tricks with dimensions.

Stereometry

Types of polyhedra; Platonic solids; the transformation of solids; orthogonal views; duality; Archimedean solids; the stretching process; the Archimedean duals; constructing paper model; close-packing; Euler’s formula; imagination 3-D transformation exercises.

Loci

Curves generated from loci problems (a circle, two parallel lines, two concentric circles, a perpendicular bisector, two angle bisectors, parabola, ellipse, hyperbola); alternative definitions; conic sections; curves in movement, the Curves of Cassini.

Math Main Lesson Blocks

1. Number bases and Loci.
2. Geometry (mensuration and stereometry)

Math Track Class meets four times per week (one of which is for “homework”)