Grade 7 & 8 Curriculum Alignment with Alaska Math Performance Standards/GLEs

As the Waldorf method places a high value on teacher independence, the following should be seen as a foundation or a departure point. Especially in the realm of resources and references, we only show a tiny fraction of what is available, the use of which is largely at the discretion of the classroom teacher. In some classes, the content/concepts may be taught in an earlier/later grade. This being said, it should be the goal of the teacher to make sure the content/concepts are taught before the end of eighth grade.

Grade 7 AK RPS/GLEs	*Grade 7 Winterberry Charter School*	*Reference*
Math	*Math*	
Understanding Numbers: **The student demonstrates understanding** **• of rational numbers (fractions, decimals, percents, or integers) by** **[7] N-1** ordering rational numbers (M1.3.1) **[7] N-2** [modeling (place value blocks) or identifying place value positions of whole numbers and decimals L] (M1.3.2) **[7] N-3** converting between expanded notation (multiples of ten) and standard form for decimal numbers (M1.3.3) **• of positive fractions, decimals, or percents by** **[7] N-4** identifying or representing equivalents of numbers (M1.3.4 & M3.3.5)	• Orders rational numbers using >,<, and = (7:2.6) • Can show the meaning of and write an exponential number in standard form • Can write exponential notations converting 10n to standard form (103 = 1,000) • Writes numbers in expanded notation (356 = 300 + 50 + 6) • Can use and explain the relationship among fractions, decimals, and percents and make conversions with numerals, manipulatives, or drawings • Identifies and plots positive and negative numbers • Has a sense of ratio and percentage • Can define the terms of a ratio and set up a proportion • Can apply concepts of percentage through interest, commission, salary	Making Math Meaningful by Jamie York pp. 17-21, 43, 44
Understanding Meaning of Operations: **The student demonstrates conceptual understanding of mathematical operations by** **[7] N-5** using models, explanations, number lines, real-life situations, describing or illustrating the effects of arithmetic operations on rational numbers (fractions, decimals) (M1.2.3)	• Can apply concepts of percentage through interest, commission, salary • Describes and analyzes patterns to generalize relationships between values by using tables and simple rules • Generates and organizes data and reports in a variety of ways (tables, charts, graphs) including pictobar, line, and circle • Calculation of fractions, decimals, and percent in real life situations	Making Math Meaningful by Jamie York pp. 27, 52, 53
Number Theory: **The student demonstrates conceptual understanding of number theory by**	• Demonstrates understanding of communicative, associative, identity and distributive properties with addition and multiplication • Use rules of divisibility as a tool for problem	Making Math Meaningful by Jamie York pp. 13, 41, 43, 48, 51, 90, 164,

[7] N-6 using commutative, [associative L], inverse, or identity properties with rational numbers (M1.3.6) **[7] N-7** applying rules of divisibility to whole numbers (M1.3.5) **[7] N-8** identifying prime and composite numbers (M1.3.5) **[7] N-9** [using distributive property with rational numbers L] (M1.3.6)	solving • Recognizes prime and composite numbers, factors, and multiples through 144 • Uses exponents to write the prime factorization of a number (7:2.1)	168
Measurable Attributes: **The student demonstrates understanding of measurable attributes by** **[7] MEA-1** [estimating length to the nearest sixteenth of an inch or millimeter, volume to the nearest cubic centimeter or milliliter or angle to the nearest 30 degrees L] (M2.3.1) **[7] MEA-2** identifying or using equivalent English (square inches, square feet, square yards) or metric systems (square centimeters, square meters) (M2.3.2)	• Can select, estimate, and measure using appropriate units, tools, and formulas • Estimates and measures length, weight/mass, area, and volume using all standard and metric units • Selects and uses appropriate units of measurement in problem-solving • Can problem solve using conversions of units of measurement	Making Math Meaningful by Jamie York pp. 26, 27, 42, 84
Measurable Techniques: **The student uses measurement techniques by** **[7] MEA-3** applying a given scale factor to find missing dimensions of similar figures (M2.3.4) **[7] MEA-4** measuring various dimensions to one-sixteenth of an inch or millimeter (M2.3.1) **[7] MEA-5** accurately measuring a given angles using a protractor to the nearest plus or minus 2 degrees (M2.3.1) **[7] MEA-6** solving real-world problems involving elapsed time between world time zones (M2.3.5)	• Understands similarity and congruence in triangles, squares and rectangles • Uses scale factor in problems with similarity • Estimates and measures using all standard and metric units • Selects and uses appropriate units of measurement in problem-solving Can problem solve using conversions of units of measurement • Can measure and construct angles using a protractor • Proficiently adds and subtracts time, including problems dealing with world time zones (Grade 6 and during Grade 8 geography block)	Making Math Meaningful by Jamie York pp. 30, 42, 61, 62

Estimation: **The student solves problems (including real-world situations) using estimation by** **[7] E&C-**1 identifying or using [a variety of L**]** strategies, including truncating, rounding, front-end estimation, compatible numbers, to check for reasonableness of solutions (M3.3.1) **[7] E & C 2** [comparing results of different strategies L] (M3.3.1)	• Can use and identify a variety of estimation strategies • Can use mental estimation • Can justify and compare the use of different strategies • Can round any whole number or decimal to a specific place	Making Math Meaningful by Jamie York Also see workbook
Computation: **The student accurately solves problems (including real-world situations) involving** **[7] E&C-3** adding or subtracting fractions or mixed numbers with unlike denominators, or decimals to the thousandths place (M3.3.3) **[7] E & C-4** multiplying or dividing decimals to hundredths, or multiplying or dividing by powers of ten, or multiplying or dividing fractions or mixed numbers (M3.3.4) **[7] E&C-5** converting between equivalent fractions, terminating decimals, or percents (10% = 1/10 = 0.1) (M3.3.5) **[7] E&C-6** solving proportions using a given scale (M3.3.6)	• Fraction problems involving all four operations and carrying and borrowing (including problems with unlike denominators) • Mixed numbers problems involving all four operations (including problems with unlike denominators) • Decimal problems involving all four operations (to the thousandths place) • Conversion among mixed numbers, fractions, decimals and percents • Can define the terms of a ratio and set up and solve a proportion. • Perspective drawing	Making Math Meaningful by Jamie York pp. 52, 53, 87, 88
Describing Patterns and Functions: **The student demonstrates conceptual understanding of functions, patterns, or sequences including those represented in real-world situations by** **[7] F&R-1** describing or extending patterns (linear), up to ten terms, represented in tables, sequences, or in problem situations (M4.3.1) **[7] F&R-2** generalizing relationships (linear) using a table of ordered pairs, a function, or an equation (M4.3.4) **[7] F&R-3** describing in words how a change in one variable in a formula	• Interprets, extends and creates complex number patterns • Describes and analyzes patterns to generalize relationships between values by using tables and simple rules • Can identify the rule when a pair of numbers have a common function • Predicts and graphs ordered pairs and simple equations • Can describe in words how changing one variable affects the remaining variables • Use a calculator for all four operations and for work with patterns.	*Live Education*: "Nature, Number and Geometry," pp. 32-45 "Key to Algebra" by Julie King and Peter Rasmussen Books 8 & 9 Making Math Meaningful by Jamie York pp. 44, 55-56, 70

affects the remaining variables (how changing the length affects the area of a quadrilateral) (M4.3.2) **[7] F&R-4** [using a calculator as a tool when describing, extending, or representing patterns L] (M4.3.3)		
Modeling & Solving Equations & Inequalities: **The student demonstrates algebraic thinking by** **[7] F&R-5** evaluating algebraic expressions (M4.3.5) **[7] F&R-6** solving or identifying solutions to one-step linear equations of the form x±a=b or ax=b, where a and b are whole numbers, translating a story problem into an equation of similar form, or translating a story problem into an equation of similar form and solving it (M4.3.5)	• Can perform four operations algebraically • Uses variables in an expression or equation with positive and negative numbers • Evaluates algebraic expressions by substituting values for a variable (7:10.3) • Can work formulas as a basis of equations • Can work problems with the correct order of operation • Solves one-step linear equations using inverse operations	Making Math Meaningful by Jamie York pp. 54, 58, 90, 91
Geometric Relationships: **The student demonstrates an understanding of geometric relationships by** **[7] G-1** using the attributes and properties of polygons (diagonals, number of sides and angles) to identify and classify regular or irregular polygons (M5.3.1) **[7] G-2** using the attributes and properties of prisms (vertices, length and alignment of edges, shape and number of bases, shape of faces) to identify and describe triangular or rectangular pyramids (M5.3.2)	• Can identify, classify and draw constructions of simple and irregular polygons • Can identify , classify and draw triangular and rectangular pyramids using prisms (also in Grade 8)	Making Math Meaningful by Jamie York pp. 30, 98
Transformation of Shapes: **The student demonstrates conceptual understanding of similarity, congruence, symmetry, or transformations of shapes by**	• Perspective and scale drawings (can be linked with modern history main-lesson) • Exact spatial perspective drawing including the golden ratio (Grade 8) • Understands concepts of similarity and congruence in triangles, squares, and rectangles • Draw translations, reflections, rotations, or dilations (also in Grade 6)	Making Math Meaningful by Jamie York pp. 30, 106

results of applying transformations such as translations, rotations, reflections, or dilations to figures L] (M5.3.5)		
Perimeter, Area, & Volume: **The student solves problems (including real-world situations) by** **[7] G-5** determining the volume of cubes and rectangular prisms (M5.3.4) **[7] G-6** determining the surface area of rectangular prisms (M5.3.4) **[7] G-7** determining the circumference of a circle (M5.3.4)	• Can compute areas of basic polygons including a circle • Can compute areas of surfaces of solids • Can calculate volume of rectangular solids using formulas • Can construct a parallelogram and compute the area • Calculates the perimeter of any polygon and the circumference of a circle (Grade 6)	Making Math Meaningful by Jamie York pp. 40, 60, 95, 97
Position & Direction: **The student demonstrates understanding of position and direction by** **[7] G-8** graphing or identifying values of variables on a coordinate grid (M5.3.6)	• Read coordinates (e.g. for map reading) • Predicts and graphs ordered pairs and simple equations	"Key to Algebra" by Julie King and Peter Rasmussen Books 8 & 9
Construction: **The student demonstrates a conceptual understanding of geometric drawings or constructions by** **[7] G-9** [drawing or measuring polygons with given dimensions and angles or circles with given dimensions L] (M5.3.7)	• Can draw geometric constructions of simple and irregular polygons • Draws geometric shapes using a straight edge and a compass (Grade 6) • Accurate construction of angles using compasses, bisecting angles (Grade 6) • Can measure and construct angles using a protractor	Making Math Meaningful by Jamie York pp. 31-39
Data Display: **The student demonstrates an ability to classify and organize data by** **[7] S&P-1** [collecting, L] displaying, organizing, or explaining the classification of data in real-world problems (e.g., science or humanities, peers or community), using circle graphs, frequency distributions, stem and leaf, [or scatter plots L] with appropriate scale (M6.3.1)	• Generates and organizes data and reports in a variety of ways (tables, charts, graphs) including pictobar, line, and circle graphs, frequency distributions, stem and leaf, scatter plots • Can apply concepts of percentage through interest, commission, salary • Uses money in real life situations to compute change, describe equivalencies, and determine percentages • Calculate mechanical advantage in simple machines e.g. pulleys, levers	Making Math Meaningful by Jamie York pp. 43-44 <u>Physics is Fun</u> by Roberto Trostli pp. 177-185 Also see G-8
	• Analyzes data as fractions, decimals, and	Making Math

Analysis & Central Tendency: **The student demonstrates an ability to analyze data (comparing, explaining, interpreting, evaluating or making predictions; or drawing or justifying conclusions) by** **[7] S&P-2** using information from a variety of displays (e.g., as found in graphical displays in newspapers and magazines) (M6.3.2) **[7] S&P-3** determining range, mean, median, or mode (M6.3.3)	percents. Finds the average. Draws conclusions • Predicts outcomes as fractions, decimals, ratios, and percents • Determines range, mean, median and mode	Meaningful by Jamie York p. 28
Probability: **The student demonstrates a conceptual understanding of probability and counting techniques by** **[7] S&P-4** determining the [experimental L] and theoretical probability of a simple event (M6.3.5) **[7] S&P-5** using a systematic approach to finding sample spaces or to making predictions about the probability of independent events (M6.3.5) **[7] S&P-6** [designing and conducting a simulation to study a problem and communicate the results L] (M6.3.6)	• Analyzes data as fractions, decimals, and percents. Finds the average. Draws conclusions • Determines experimental and theoretical probability • Predicts outcomes as fractions, decimals, ratios, and percents • Designs and conducts simulations to study a problem and communicate results	Probability is traditionally covered in the 9th grade Waldorf curriculum. For a treatment of probability, the Math Learning Center's *Visual Mathematics* would be a good resource, among others. Games involving probability would be a great starting point. This block should be taught no earlier than 8th grade.
Problem Solving: Understand and be able to select and use a variety of problem-solving strategies **The student demonstrates an ability to problem solve by** **[7] PS-1** selecting, modifying, and applying a variety of problem-solving strategies (e.g., working backwards, drawing a picture, Venn diagrams and verifying the results) (M7.3.2) **[7] PS-2** evaluating, interpreting, and justifying solutions to problems (M7.3.3)	• Can use a variety of problem-solving strategies: • Guess and check • Solve a simpler model • Work backwards • Draw diagram or Venn diagram • Systematic lists • Eliminate possibilities • Can select and use the appropriate method to solve a problem (mental math, estimation, paper and pencil) and choose the operation needed • Can solve a problem in more than one way • Can use number sense to justify the reasonableness of solutions to problems involving whole numbers, fractions, decimals,	See workbook for Making Math Meaningful by Jamie York Mental Math

	and percents	
Communication: Form and use appropriate methods to define and explain mathematical relationships **The student communicates his or her mathematical thinking by** **[7] PS-3** representing mathematical problems numerically, graphically, and/or symbolically; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions (M8.3.1, M8.3.2, & M8.3.3)	• Generates and organizes data and reports in a variety of ways (tables, charts, graphs) including pictobar, line, and circle • Proves Pythagorean theorem with transformations or visual and algebraic proofs • Can use number sense to justify the reasonableness of solutions to problems involving whole numbers, fractions, decimals, and percents • Uses appropriate vocabulary and symbols	Making Math Meaningful by Jamie York pp. 69, 79, 95 See workbook *Live Education*: "Nature, Number and Geometry," pp. 32-45
Reasoning: Use logic and reason to solve mathematical problems **[7] PS-4** using informal deductive and inductive reasoning in concrete contexts or stating counterexamples to disprove statements; or justifying and defending the validity of mathematical strategies and solutions using examples (M9.3.1, M9.3.2, & M9.3.3)	• Apply the Rule of Three (if, then, therefore) to solve practical problems (Grade 5) • Geometric proofs of the sums of the angles of a triangle (Grade 6) and of the Pythagorean theorem (Grade 6/7)	Making Math Meaningful by Jamie York pp. 67-71
Connections: Apply mathematical concepts and processes to situations within and outside of school **The student understands and applies mathematical skills and processes across the content strands by** **[7] PS-5** using real-world contexts such as science, humanities, peers, and community (M10.3.1 & M10.3.2)	• Has knowledge of banking including: mortgage, lenders, insurance, taxes, stocks, compound interest, monopoly, charge accounts, installment purchasing • Can apply concepts of percentage through interest, commission, salary • Uses money in real life situations to compute change, describe equivalencies, and determine percentages • Calculate mechanical advantage in simple machines e.g. pulleys, levers • Calculation of fractions, decimals, and percent in real life situations •	Making Math Meaningful by Jamie York pp. 22-25 Mental Math Physics is Fun by Roberto Trostli pp. 177-185
Grade 8 AK RPS/GLEs	***Grade 8 Winterberry Charter School***	
Math	***Math***	
Understanding Numbers: **The student demonstrates understanding** **• of real numbers by** **[8] N-1** ordering real numbers (M1.3.1) **[8] N-2** distinguishing between a whole number in scientific notation	• • • Orders real numbers using >, <, and = (8:2.5) • • Represents the value of a number in a variety of forms (standard, expanded, exponential, scientific notation) • • Uses and explains the relationships among fractions, decimals, and percents and make	Making Math Meaningful by Jamie York pp. 13, 90

and real numbers in standard form (M1.3.1) **[8] N-3** converting between expanded notation (multiples of ten with exponents) and standard form (M1.3.3) • **of rational numbers (fractions, decimals, or percents including integers) by** **[8] N-4** identifying, describing, or illustrating equivalent representations (M1.3.4 & M3.3.5) **[8] N-5** expressing products of numbers using exponents (M1.3.1 & M1.3.3)	conversions • • • •	
Understanding Meaning of Operations: **The student demonstrates conceptual understanding of mathematical operations by** **[8] N-6** using models, explanations, number lines, real-life situations, describing or illustrating the effects of arithmetic operations on rational numbers (percents) (M1.2.3) **[8] N-7** using models, explanations, number lines, real-life situations, describing or illustrating the use of inverse operations (addition/subtraction or multiplication/division) (M1.2.3)	• • Can use number sense to justify the reasonableness of solutions to problems involving whole numbers, fractions, decimals, and percents • • Represents the value of a number in a variety of forms (standard, expanded, exponential, scientific notation) • • Uses inverse operations to solve simple equations (Grade 7) • • •	Making Math Meaningful by Jamie York pp. 22, 43, 80
Number Theory: **The student demonstrates conceptual understanding of number theory by** **[8] N-8** applying the rules for order of operations to rational numbers (M1.3.5) **[8] N-9** identifying or writing the prime factorization of a number using exponents (M1.3.5) **[8] N-10** [using distributive property with real numbers L] (M1.3.6)	• • • • Extends order of operations to problems with rational numbers • • Understands distributive property of multiplication with respect to addition and multiplication • • Represents the value of a number in a variety of forms (standard, expanded, exponential, scientific notation) • • • •	Making Math Meaningful by Jamie York pp. 14, 20, 89, 90

Measurable Attributes: **The student demonstrates understanding of measurable attributes by** **[8] MEA-1** converting measurements within the same system (English or metric) (M2.3.2)	• • • • Can select, estimate, and measure length, weight/mass, area, and volume using appropriate units, tools, and formulas • • • • • • • •	Making Math Meaningful by Jamie York p. 42
Measurement Techniques: **The student uses measurement techniques by** **[8] MEA-2** using scale drawings involving indirect measurement (determining the scale factor and applying it to find missing dimension) (M2.3.4) **[8] MEA-3** [modeling the conversion within the same system L] (M2.3.2	• • • • Can measure and construct angles • Uses calculator to add, subtract, multiply, and divide accurately • Perspective and scale drawings (Linked with modern history main-lesson) • Exact spatial perspective drawing including the golden ratio. • Interprets, extends, and creates complex number (Grade 7) •	Making Math Meaningful by Jamie York pp. 83-85
Estimation: **The student solves problems (including real-world situations) using estimation by** **[8] E&C-1** [applying and assessing the appropriateness of a variety of estimation strategies L] (M3.3.1)	• • • Can mentally solve problems involving all four operations, squares, estimation, sets, and distribution • Can select and use the appropriate method to solve a problem (mental math, estimation, paper and pencil, calculator) and choose the operation needed • •	Making Math Meaningful by Jamie York pp. 58, 63 See workbook Mental Math
Computation: **The student accurately solves problems (including real-world situations) involving** **[8] E&C-2** adding, subtracting, multiplying or dividing integers or positive rational numbers (M3.3.3 & M3.3.4) **[8] E&C-3** percents and percentages (e.g., tax, discount) (M3.3.3 & M3.3.4)	• • Uses paper and pencil to solve: • Calculates using order of operations (P-E-MD-AS: Parenthesis, exponent, multiply, divide, add, and subtract) •Addition, subtraction, multiplication, and division of whole numbers, decimals, fractions, mixed numbers, and integers • Calculating positive and negative integers using four operations • Calculation of fractions, decimals, and percents in real life situations/problems • Application of estimation	Making Math Meaningful by Jamie York pp. 14-20, 28, 45

[8] E&C-4 converting between equivalent fractions, decimals, or percents (M3.3.5) **[8] E&C-5** ratio and proportion (M3.3.6)	• Can mentally solve problems involving all four processes, squares, estimation, sets, and distribution • Solves problems using ratio (including rates) and proportion (8:2.1) • • • •	
Describing Patterns & Functions: **The student demonstrates conceptual understanding of functions, patterns, or sequences including those represented in real-world situations by** **[8] F&R-1** describing or extending patterns (linear), up to the nth term, represented in, tables, sequences, graphs, or in problem situations (M4.3.1) **[8] F&R-2** generalizing relationships (linear) using a table of ordered pairs, a graph, or an equation (M4.3.4) **[8] F&R-3** describing in words how a change in one variable in a formula affects the remaining variables (how changing the length affects the area of quadrilaterals or volume of a rectangular prism) (M4.3.2) **[8] F&R-4** [using a calculator as a tool when describing, extending, or representing patterns L] (M4.3.3)	• • • • Interprets, extends, and creates complex number patterns • • Describes and analyzes patterns and relationships using tables, coordinate graphs, verbal rules, and standard algebraic notation • Solves linear equations and formulas in problem-solving situations • Solves and graphs simple linear equations and ordered pairs of numbers • Can solve formulas as the basis of equations •	Making Math Meaningful by Jamie York pp. 44, 55-56, 70 Key to Algebra (series) by Julie King and Peter Rasmussen
Modeling & Solving Equations & Inequalities: **The student demonstrates algebraic thinking by** **[8] F&R-5** translating a written phrase to an algebraic expression (M4.3.5) **[8] F&R-6** solving or identifying solutions to two-step linear equations of the form $ax \pm b = c$, where a, b and c are rational numbers, and $a \neq 0$, translating a story problem into an equation of similar form, or translating a story problem into an equation of similar form and solving it (M4.3.5)	• • • • Can quickly and accurately access all math facts as a tool for problem solving • • Can work problems using formulas to solve problems • Use algebra as a general solution to specific problems (Grade 7) • Translate word phrases and problems into algebraic expressions (8:10.1), [8] F&R-5 • • •	Making Math Meaningful by Jamie York pp. 54, 58, 90

Geometric Relationships: **The student demonstrates an understanding of geometric relationships by** **[8] G-1** [using the attributes and properties of regular polygons to sketch regular or irregular polygons L] (M5.3.1) **[8] G-2** using the attributes and properties of solid figures (vertices, length and alignment of edges, shape and number of bases) to identify and describe cylinders and cones (M5.3.2) **[8] G-3** using two-dimensional nets to create three-dimensional objects (prisms and cylinders) (M5.3.2)	• Can draw geometric constructions of regular and irregular polygons • Describes, identifies, and classifies cylinders and cones • Creates prisms and cylinders from nets •	Making Math Meaningful by Jamie York pp. 98-100
Transformation of Shapes: **[8] G-4** using proportionality to solve real-world problems involving similar shapes (e.g., two real-world objects casting shadows) (M5.3.3) **[8] G-5** identifying the results of applying transformations (translations, rotations, reflections, dilations) to figures on a coordinate plane (M5.3.5)	• Applies translations, reflections, rotations and dilations to the coordinate plane (Grade 6/7) • Works extensively with proportion problems • • • • •	Making Math Meaningful by Jamie York p. 106
Perimeter, Area, and Volume: **The student solves problems (including real-world situations) by** **[8] G-6** determining the volume of right triangular prisms or cylinders (M5.3.4) **[8] G-7** determining the surface area of cylinders or triangular prisms (M5.3.4) **[8] G-8** determining the circumference and area of a circle (M5.3.4)	• • • Can compute areas of surfaces of solids • Computes area and perimeter of parallelograms, trapezoids, circles, and regular polygons • • Computes surface area of regular solids • Computes volumes of regular polyhedrons (cylinders, pyramids, cones, spheres) • • • • •	Making Math Meaningful by Jamie York pp. 98-100
Position & Direction:	• • •	Key to Algebra (series) by Julie King and Peter

The student demonstrates understanding of position and direction by **[8] G-9** graphing or identifying relationships of variables on a coordinate plane (e.g., length/width, area/diameter, cost/pound) (M5.3.6)	• Generates and organizes data and reports in a variety of ways (tables, charts, graphs) including pictobar, line, and circle • Graphs linear relationships on coordinate plane • • • • •	Rasmussen Making Math Meaningful by Jamie York (frequently used)
Construction: **The student demonstrates a conceptual understanding of geometric drawings or constructions by** **[8] G-10** [drawing, measuring, or constructing geometric figures (polygons, perpendicular bisectors, or perpendicular or parallel lines) L] (M5.3.7)	• Can draw geometric constructions of more complex attributes • Can construct platonic solids: cube, tetrahedron, dodecahedron, octahedron, icosahedron • • • • • • • •	Making Math Meaningful by Jamie York pp. 60-62
Data Display: **The student demonstrates an ability to classify and organize data by** **[8] S&P-1** [designing, collecting **L**], organizing, displaying, or explaining the classification of data in real-world problems (e.g., science or humanities, peers or community), using histograms, scatter plots, or box and whisker plots with appropriate scale [or with technology L] (M6.3.1)	• • • • Generates and organizes data and reports in a variety of ways (tables,charts, graphs) including pictobar, line, and circle graphs, histograms, scatter plots, box and whisker plots • • • • • •	Making Math Meaningful by Jamie York (frequently used and an integral part of our approach)
Analysis & Central Tendency: **The student demonstrates an ability to analyze data (comparing, explaining, interpreting, evaluating, making predictions, or describing trends; or**	• • • • • • Further statistical work including mean, mode and median, justifying choice of measure of central tendency • Analyzes data as fractions, decimals, and percents and draws conclusions •	Making Math Meaningful by Jamie York p. 78

[8] S&P-3 determining or justifying a choice of range, mean, median, or mode as the best representation of data for a practical situation (M6.3.3)		
Probability: **The student demonstrates a conceptual understanding of probability and counting techniques by** **[8] S&P-4** determining or comparing the experimental and/or theoretical probability of simple events (M6.3.5) **[8] S&P-5** using a systematic approach to finding sample spaces or to making predictions about the probability of independent events and using the information to solve real-world problems (M6.3.5) **[8] S&P-6** [designing and conducting a simulation to study a problem and communicate the results L] (M6.3.6)	•Determine and compare experimental and theoretical probability • Predicts outcomes of independent events • Finds the average. Draws conclusions • Designs and conducts simulations to study a problem and communicate results • •	Probability is traditionally covered in the 9th grade Waldorf curriculum. For a treatment of probability, the Math Learning Center's *Visual Mathematics* would be a good resource. Games involving probability would be a great starting point.
Problem Solving: Understand and be able to select and use a variety of problem-solving strategies **The student demonstrates an ability to problem solve by** **[8] PS-1** selecting, modifying, and applying a variety of problem-solving strategies (e.g., inductive and deductive reasoning, Venn diagrams, making a simpler problem) and verifying the results (M7.3.2) **[8] PS-2** evaluating, interpreting, and justifying solutions to problems (M7.3.3)	• • • Can use a variety of problem-solving strategies: • Guess and check • Solve a simpler model • Work backwards • Make a table or graph • Make a model or drawing • • Can quickly and accurately access all math facts as a tool for problem solving • •Evaluates, interprets and justifies solutions [8PS-2] • • • • •	See workbook for Making Math Meaningful by Jamie York Mental Math
Communication: Form and use appropriate methods to define and explain mathematical relationships **The student communicates his or her mathematical thinking by** **[8] PS-3** representing mathematical	• • • • • • Generates and organizes data and reports in a variety of ways (tables, charts, graphs)	Making Math Meaningful by Jamie York

problems numerically, graphically, and/or symbolically, translating among these alternative representations; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions (M8.3.1, M8.3.2, & M8.3.3)	including pictobar, line, and circle • Uses appropriate vocabulary and symbols • Translates between numeric, graphical or symbolic representations (8:12.2) •	
Reasoning: Use logic and reason to solve mathematical problems **The student demonstrates an ability to use logic and reason by** **[8] PS-4** generalizing from patterns of observations (inductive reasoning) about mathematical problems and testing using a logical verification (deductive reasoning); or justifying and defending the validity of mathematical strategies and solutions using examples and counterexamples (M9.3.1, M9.3.2, & M9.3.3)	• • • • • Finds the average. Draws conclusions • Uses inductive and deductive reasoning to solve problems • Justifies and defends mathematical strategies and solutions •	Making Math Meaningful by Jamie York (frequently used) <u>Physics is Fun</u> by Roberto Trostli pp. 243-253
Connections: Apply mathematical concepts and processes to situations within and outside of school **The student understands and applies mathematical skills and processes across the content strands by** **[8] PS-5** using real-world contexts such as science, humanities, peers, community, and careers (M10.3.1 & M10.4.2)	• • • • • Uses money in real life situations to compute change, describe equivalencies, and determine percentages • • Has knowledge of banking including: mortgage, lenders, insurance, taxes, stocks, compound interest, monopoly, charge accounts, installment purchasing Can apply concepts of percentage through interest, commission, salary •	Making Math Meaningful by Jamie York pp. 52, 53, 87, 88

<u>Winterberry Charter School Science Blocks at a Glance</u>

7th Grade Science

- ∞ Physiology
- ∞ Physics
- ∞ Chemistry

*The history of science and scientific inquiry is included in the history blocks for 7th grade: Late Medieval History, Geography and the Age of Exploration and Renaissance History. This is done primarily through biographies of the figures involved (for example: Leonardo da Vinci).

8th Grade Science

- ∞ Physiology/Human Anatomy

- ∞ Physics
- ∞ Chemistry
- ∞ Meteorology

*The history of science and scientific inquiry is included in the history blocks for 8th grade: the Reformation and the Age of Revolutions. This is done primarily through biographies of the figures involved (for example--Copernicus, Galileo, Kepler, Watt, Franklin).

Blocks typically range from three to five weeks in length.

Science Topics Covered in Earlier Grades

- ∞ 4th Grade—Zoology
- ∞ 5th Grade—Botany
- ∞ 6th Grade—Geology, Physics and Astronomy

Note: Section A is a listing of the concepts that are traditionally part of a Waldorf-inspired curriculum. Section B is a listing of the ASD Integrated Science Framework and when those concepts are covered in the Waldorf-inspired curriculum.

SECTION A

Overarching Concepts (common in all of the above blocks for both 7th and 8th grade):

Nature of Science/Scientific Method

1. The scientific method is a process people use to understand and predict natural phenomena.
2. Scientific principles are demonstrated in daily life.

7th Grade

Physiology

1. Physiology illustrates the complementary nature of structure and function.
    a. Humans have levels of organization for structure and function including organ systems, organs, tissues and cells.
    b. Organ systems function because of the contributions of individual organs and tissues.
2. The ***digestive*** system helps us assimilate food.
    a. The teeth, mouth, esophagus, stomach, small and large intestines and colon function in the system.
    b. The kidney removes cellular wastes from the blood and converts them into urine.
    c. The gallbladder.
    d. The liver.
3. The ***circulatory*** system circulates blood through the heart chambers, lungs and body.
    a. Contractions of the heart generate blood pressure.
    b. Heart valves prevent backflow of blood.
4. The ***respiratory*** system circulates oxygen and carbon dioxide.
    a. The arterial system takes oxygen throughout the body. It includes:
    b. The system of veins carries carbon dioxide to the heart. It includes:
5. The ***reproductive*** organs of the human female and male generate eggs and sperm. Sexual activity may lead to fertilization

and pregnancy.

a. The umbilicus and placenta function during pregnancy.

Chemistry

1. Physical processes do not create permanent change.
2. Chemical reactions completely transform a substance.

Combustion is an example.

a. When fuel is consumed, energy (heat, light and smoke) are released. Most of the energy is heat energy.
b. Ash remains.
c. Oxygen is used and carbon is released CO2.
d. Fire is extinguished with sand, cloth, water and foam.
e. Fire is structured and orderly.
f. Human history changed with the invention of fire.
g. Fire is essential in so many processes today.
h. Some inorganic substances have particular combustible characteristics.

3. ***Salts*** are compounds made up of acids and bases.

a. Salts may be broken down into acids and bases.
b. Acids have certain characteristics: vapory matter, sour taste, turns litmus paper red.
c. Bases have certain characteristics: solid matter, insipid, turn litmus paper blue.
d. Acids and bases may combine to form a salt. The salt process is a formation (or contraction) process.
e. A "catalyst" speeds along a chemical reaction.
f. An "indicator" is a substance that shows whether a substance is acidic or basic.

3. ***Water*** has many properties.

a. Water is a unifying element, essential to all life.
b. It is composed of hydrogen and oxygen.

4. ***Metals*** have many properties.

a. Properties such as electrical and thermal conductivity are common in metals. Most have a luster.
b. Some metals are pure elements; others are combinations of elements.

5. ***Gases*** have different properties.

Physics

1. Musical intervals and resonance are part of ***sound.***

a. Musical intervals are created when notes sound together.
b. The relative consonance of musical intervals can be expressed by mathematical ratios.
c. The length of a column of air determines the pitch of blown sound.
d. A sounding object can cause another object to sound.
e. Overtones follow a predictable sequence.

2. ***Light*** has observable properties.

a. Light can be reflected.
b. The angle of incidence equals the angle of reflection.
c. Light can be focused to create images by a small aperture, lenses or curved mirrors.

3. ***Heat*** can be measured.

a. Every substance has a specific boiling and freezing point which can be raised or lowered.

b. The density of a substance is affected by heating and cooling.

4. ***Static electricity and electricity*** have certain properties.
   a. Electrostatic charges can be stored.
   b. Current electricity can be generated by chemical reactions.
5. ***Electricity and magnetism*** are related.
   a. Magnetism can be created by electricity.
   b. Electric currents produce magnetic fields.
   c. Electromagnetism can be used to create motion, light or heat.
6. There are six simple ***machines*** that increase mechanical advantage.
   a. There are three classes of levers.
   b. The law of the lever says that equal weight at equal distances balance each other, but different weights can balance each other at different distances.
   c. The pulley is a flexible lever going over a curved surface.
   d. Mechanical Advantage = Load x Effort.
   e. The Velocity Ratio = Distance of effort moves/Distance of load moves.
   f. The axle and wheel increase mechanical advantage.
   g. The mechanical advantage here is load/effect.
   h. Inclined planes give mechanical advantage.
   i. The wedge and screw also are simple machines.
7. Unbalanced ***force*** can cause change in velocity.
   a. Forces have direction and magnitude.
   b. When an object is subject to two or more forces at once, the effect is cumulative.
   c. When the forces of an object are balanced, the motion of an object does not change.
   d. The greater the mass of an object, the more force is needed to achieve the same change in motion.
   e. Friction reduces mechanical advantage of all machines.

8th Grade

Chemistry

1. Sugars, starches and indigestible roughage in our food are called ***carbohydrates.***
   a. Carbohydrates may be divided into monosaccharides (simple sugars), disaccharides and polysaccharides.
   b. Monosaccharides are glucose, fructose and galactose.
   c. Glucose, fructose and sucrose are found in fruits and honey.
   d. Glucose is the sugar present in human blood.
   e. Fructose is the sweetest of all sugars.
   f. Galactose does not occur freely; it is combined with glucose in milk sugar (lactose).
   g. Disaccharides are combinations of monosaccharides.
   h. Sucrose (table sugar) is glucose and fructose combined.
   i. Polysaccharides are denser compounds formed from monosaccharides. Starch and cellulose are examples.
   j. Starch is the means by which plants store energy and a staple in a human's diet.
   k. Glycogen is animal starch.

l. Humans store energy mostly in fat. 80% of our glucose is found in muscle tissue.

m.Cellulose is the most organic compound. It is the principal structural material in plants and used for housing, clothing, paper, fabric and explosives.

n. Carbohydrates are made up of carbon, hydrogen and oxygen.

2. ***Proteins*** are complex compounds made principally from carbon, hydrogen, oxygen and nitrogen.

a. They are essential building materials for all living cells.

b. Animal products (meat, dairy, eggs) and vegetables (legumes) and grains can provide complete proteins.

c. In a living organism, proteins are mobile in solution.

d. Heat destroys the structure of proteins and causes them to coagulate and precipitate out of solution. When proteins fall out of a living state they become hard and fixed (hams, hooves).

3. ***Fats and oils*** are necessary compounds in our diets and bodies and have particular characteristics.

a. Fats and oils have different melting points.

b. All fats contain glycerol.

c. Oil and water do not combine.

d. An emulsifying agent has the properties of water and oil so it can overcome some of the antagonism between the two substances. When mixed in water, oil becomes suspended.

e. Grease fires may not be extinguished by water.

f. The role of oil in cooking is to conduct heat.

g. Fats may be broken down into fatty acids and glycerol.

h. An emulsion is a suspension of one liquid in another.

i. Unsaturated fats are more metabolically active and desirable than saturated fats.

4. Many people discovered the properties of carbohydrates, proteins and fats.

Anatomy/Physiology

1. The muscular-skeletal system gives support to the body.

a. It is made up of round, curved and straight ***bones***.

b. Some bones are connected and move; others are stationary.

c. There are different kinds of bones based on their shapes: long, short, irregular, flat, wormian.

d. Bones grow by the process of creating and breaking down cells. Babies have a softer substance for bone called cartilage. Cartilage cells break down to form bone cells.

e. A bone is covered with periosteum. Red and white blood cells are created in the marrow.

2. The skull begins as a curved jigsaw of nearly 30 pieces of cartilage, bone and membrane and becomes solid.

a. Fonaneles are "soft spots" on a baby's head.

b. Cranial structures are joints holding the skull together.

c. The skull has stationary and moveable parts.

3. The backbone is composed of three types of vertebrae: cervical, dorsal and lumbar which protect the spinal cord.

4. The pelvis is made up of six bones, fused together in an adult: ilium, pubic, ischium, sacrum, acetabulum, coccyx. A man's and woman's pelvis differ.

5. The bones in the arm are the humerus, radius and ulna.
    a. The two forearm bones can cross.
    b. The wrist (or carpus) consists of eight bones.
    c. Hand bones are metacarpals; finger bones are phalanges.
    d. There is great mobility in the first metacarpal or thumb.
    e. The bones and joints of the arm work as levers.
6. There are many bones in the leg, knee and foot.
    a. The leg bones are: the femur, the patella, the tibia and fibula.
    b. Three parts of the foot are called the tarsus, metatarsus and phalanges.
    c. Ligaments, tendons and cartilage add stability to the knee.
7. There are three basic types of ***muscles***.
    a. Smooth muscles coat our digestive organs.
    b. Cardiac muscles pump our blood.
    c. Skeletal or striated muscles primarily move limbs.
    d. Muscles must have glucose and oxygen and produce carbonic dioxide and lactic acid.
    e. Muscles often work in pairs—one contracts/the other relaxes.
    f. The biceps and triceps are in the upper arm.
    g. The quadriceps and hamstring muscles are in the thigh.
    h. The muscles over the knee act similarly to pulleys.
8. ***Joints*** in the body (wrist, ankle, shoulder, thigh, etc.) are like structures used in simple devices (hinge, ball-and-socket and sliding joints).
9. There are two basic ***nervous systems***: central and peripheral.
    a. The central consists of the brain and the spinal cord.
    b. The peripheral, or autonomic, nerves work on their own accord.
    c. A nerve is composed of a neuron, axon and dendrites.
10. An ***eye*** is composed of the iris, lens, cornea, pupil, sclerae, aqueous and vitreous humer, retina and optic nerve. Each has a role and adjusts to light, distance, etc.
    a. For an object to be seen, light emitted by or scattered from it must enter the eye.
    b. The image our eye makes is upside down.
    c. The lens in our eye changes so we can focus.
    d. Retinal cells (rods and cones) react differently with different wave lengths of light.
11. The e***ar*** is a complex system. The outer ear includes the canal and drum; the middle ear includes the hammer, anvil and stirrup; and the inner ear includes the semicircular canals.
    a. Our normal hearing occurs in a decibel range of 60–70.

Meteorology

1. ***Weather*** is caused by: the earth, sun, water and air.
    a. The earth's shape, rotation and orbit cause different weather patterns.
    b. The atmosphere above the earth is layered: troposphere, stratosphere and the mesosphere. Weather occurs in the troposphere—up to 8 miles above the earth.
    c. The weight of the atmosphere and pull of gravity create air pressure. Warm air is less dense and cold air is denser.
    d. The earth is warmed by solar radiation.
    e. The heat of the sun moves from the equator to the poles.

f. The turning of the earth imparts a twist to the motion of air, causing winds. This is known as the Coreolis Effect.
g. Warm air rises carrying water.
h. Clouds form from condensation of moisture in air.
i. The water cycle redistributes water.
j. Cold and warm air, holding water and moving, create high and low pressure areas. Low pressure areas bring stormy weather. High pressure areas bring clear, fair weather.
k. Two air masses meeting cause fronts. Cold and warm air fronts can bring storms.
l. Lightning bolts are electrical. Thunder is a burst of intense heat.
m. Humans can be affected by tornadoes and hurricanes.

2. Weather can be measured.
   a. Thermometer measurers temperature.
   b. Wind vanes, indicate direction of the wind.
   c. Barometer measures air pressure.
   d. Hygometer measures humidity.
   e. Rain gauge measures precipitation.
   f. Anemometer measures wind speed.
3. Weather can be forecasted by:
   a. Observing clouds and fronts.
   b. Watching weather maps.
   c. Weather changes from day to day but trends in temperature and rain tend to be predictable during a season.

Physics

1. ***Sound*** arises from vibrations of the sounding object and of the surrounding medium.
   a. Pitch corresponds to the frequency of vibration.
   b. Sounds can be reflected, directed, focused or absorbed.
   c. The transmission and speed of sound depend on the medium.
   d. Sound travels in longitudinal waves.
2. ***Light*** has certain properties.
   a. The propagation of light is affected by the medium through which it passes.
   b. Light can be refracted.
   c. Color can be created through refraction and diffraction.
   d. Light travels in transverse waves.
3. ***Heat*** has certain properties.
   a. It can be affected by pressure.
   b. It can be reflected, focused and absorbed.
   c. It moves in a predictable flow from warmer to cooler objects until all objects are at the same temperature.
   d. Energy can be carried from one place to another by heat flow (or by waves—water, light, sound or by moving objects)
   e. Heat from the sun is the major source of energy on the earth's surface, powering winds, ocean currents and the water cycle.
   f. Solar energy (light and heat) reach earth through radiation.
   g. Heat from the earth's interior reaches the surface primarily through convection.
   h. Uneven heating of the earth causes air movements (convection

currents).
i. Convection currents distribute heat in the atmosphere and ocean.
j. Differences in pressure, heat, air movement and humidity result in changes of weather.

4. ***Electromagnetism*** has many practical applications.
a. Electromagnetism can be used to create motion.
b. Electric currents can be controlled by switches, fuses and circuits.
c. Electricity can flow in a simple, a series or a parallel circuit.
d. Some materials can conduct an electrical current while others can't.
e. A magnet moving within a coil or a coil moving within a magnet can generate an electric current.

5. ***Liquids*** have certain properties.
a. Liquids have no shape of their own.
b. Liquids seek a constant level.
c. Liquids exert pressure.
d. The pressure liquid exerts increases with depth.
e. Pressure exerted on one part of a liquid is distributed to all parts of the liquid.
f. Liquids may support substances giving them buoyancy. The density and shape of an object affects its buoyancy.
g. The buoyant force on an object in a fluid is an upward force equal to the weight of the fluid it has displaced.
h. Liquids have different densities. Density is mass per volume.
i. Liquids have surface tension.

6. ***Air*** has certain properties.
a. Air has volume and weight.
b. Air offers resistance to moving objects.
c. Air exerts pressure.
d. Moving air creates an area of lower pressure.
e. The absence of air creates a vacuum.

SECTION B

The purpose of the following chart is to clearly show which concepts in ASD's Integrated Science (IS) classes are covered by the Waldorf-inspired Winterberry Science curriculum. For many of the places where this is not harmony, we have proposed where the IS concepts might easily be fit into the Winterberry curriculum. For some concepts, however, we felt that this may be too big of a "stretch" for our curriculum to stay true to its roots. Further discussion and/or compromise may be necessary—the committee's task is simply to make recommendations. We did not include a list of concepts covered by the WCS curriculum that is not covered by the ASD IS curriculum (at least in grades 7 & 8).

	ASD Integrated Science GRADE 7 Conceptual Framework	Winterberry Charter School Science Blocks
Nature of Science	The scientific method is a process people use to understand and predict natural phenomena. 7 SA 1.1; 7 SA 1.2; 7 SA 3.1	Covered in all science blocks 6-8
	Scientific principles are demonstrated in daily life. 7 SF 1.1 - SF 3.1	Covered in all science blocks 6-8
	LIFE SCIENCE	

Diversity of Life	In classifying organisms, biologists consider details of internal and external structures to be more important than behavior or general appearance. Similarities among organisms can be used to infer the degree of relatedness among organisms. Scientists now use a seven level classification system (kingdom, phylum, class, order, family, genus, species). 7 SC 2.2; 8 SC 2.1; 9 SC 2.1	Covered in 4th grade Zoology; 5th grade Botany. Seven level classification system not traditionally taught until grades 9-12, but could be integrated into the above blocks.
	One of the most general distinctions among organisms is between plants, which use sunlight to make their own food, and animals, which consume energy-rich foods. Some kinds of organisms, many of them microscopic, cannot be neatly classified as either plants or animals. 7 SC 2.1	Covered in 4th grade Zoology; 5th grade Botany.
	All living things are composed of cells, from just one to many millions, whose details usually are visible only through a microscope. Tissues are composed of cells that carry on a specific function. Organs and organ systems are composed of tissues and help to provide all cells with basic needs. 7 SC 2.1	Not commonly taught until grades 9-12 in a traditional Waldorf school. Could integrate into 5th grade Botany for plant cells and 7th/8th grade Physiology for animal cells.
	Within cells, many of the basic functions of organisms, such as extracting energy from food, getting rid of wastes and reproduction are carried out. 7 SC 2.1	Not commonly taught until grades 9-12 in a traditional Waldorf school. Could integrate into 5th grade Botany for plant cells and 7th/8th grade Physiology for animal cells.
	Animals and plants have a great variety of body plans and internal structures that contribute to their being able to make or find food and reproduce (asexually and/or sexually). 7 SC 1.1; 8 SC 2.1	Covered in 4th grade Zoology; 5th grade Botany; 7th and 8th grade Physiology.
Human Biology	Human beings have body systems for obtaining and providing energy, defense, reproduction, and the coordination of body functions. 8 SC 2.3	Covered in 7th and 8th grade Physiology
	Viruses, bacteria, fungi and parasites may infect the human body and interfere with normal body functions.	Covered in 7th and 8th grade Physiology
	EARTH SCIENCE	
Astro-nomy	Earth turns daily on its axis. One day is defined as a complete rotation of Earth on its axis. A year is the time it takes Earth to make one complete revolution around the sun. 5 SD 4.2; 8 SD 3.1	Covered in 6th grade Astronomy
	The Earth's axis is tilted relative to the plane of the orbit around the sun, causing the seasons. 8 SD 3.1	Covered in 6th grade Astronomy

	The moon orbits around the earth once in about 28 days, which changes how much of the lighted portion can be seen from the earth. This process is called the "phases of the moon." 5 SD 3.1	Covered in 6th grade Astronomy
Weather and Climate	Water evaporates from the surface of the earth, rises and cools, and then condenses into rain or snow. The water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the ocean. This cycle is driven by solar energy. 7 SD 1.2; 7 SD 3.2	Covered in 8th grade Meteorology
	Earth's weather cycles are influenced by: energy from the sun, the transfer by convection, conduction, and/or radiation of solar energy within the Earth's systems, the Earth's position and motion in our solar system, and land features. Weather is described using meteorological terms. 7 SD 3.2; 8 SD 3.2	Covered in 8th grade Meteorology
Geology	All rocks originate from the earth's magma and are composed of minerals. The rock cycle describes the relationship to igneous, sedimentary and metamorphic rocks. 7 SD 1.1	Covered in 6th grade Geology
	PHYSICAL SCIENCE-- CHEMISTRY	
Atoms	Characteristic properties for a give substance never change and therefore can be used to identify matter. Examples of properties are boiling point, melting point, density, and conductivity. 7 SB 1.1	Covered in 7th/8th grade chemistry
	All matter is made up of atoms that are composed of protons, neutrons, and electrons. The Periodic Table is a tool that organizes the elements. 9 SB 1.1; 10 SB 1.1	Not commonly taught until grades 9-12 in Waldorf schools. Could be integrated into the 8th grade Chemistry block
Matter Has Measur-able Proper-ties	Equal volumes of different substances usually have different mass. 7 SB 1.1	Not traditionally taught in the Waldorf K-8 curriculum. Could possibly be added to the 7th grade Physics block since concepts such as volume and mass are discussed.
	Physical changes alter the form of a substance, not its chemical makeup. It may be a change in shape or size or change in phase. 7 SB 1.1	Covered in 7th grade Chemistry; see also 6th -8th grade Physics
	On Earth, matter can occur in nature in three phases; solids, liquids, and gases. The phase of matter is determined by the energy and motion of atoms of the	Covered in 7th grade Chemistry; see also 6th -8th grade Physics. Describing phases of matter at the atomic level is not commonly taught in Waldorf

	material. 7 SB 3.1; 8 SB 3.1	schools until grades 9-12. Could be integrated into the 8th grade Chemistry block.
	PHYSICAL SCIENCE—PHYSICS	
Motion	Newton's Three Laws of Motion describe the relationships among mass, force, and acceleration. The motion of an object is dependent upon the relationship of these concepts. 7 SB 4.1; 8 SB 4.1	Covered at least partially in 7th grade Physics and its treatment of machines and mechanical advantage. Newton is mentioned as a historical figure in the "Revolutionaries and Romantics" 8th grade block.
	The gravitational pull on an object is the object's weight. Gravitational forces are dependent upon a variety of factors. 7 SB 4.1	Not traditionally taught in the Waldorf K-8 curriculum. Could be combined with the other mass-related concepts and be integrated with the 7th grade Physics block.
Waves	Waves transfer some kinds of energy from one place to another. All waves have specific characteristics. Vibration in materials set up wave-like disturbances that spread away from the source. 7 SB 4.3	Covered in 8th grade Physics
	Energy from the sun is made up of a mixture of many different colors of light even though to the human eye the light looks almost white. Non-luminous objects appear to be different colors, depending upon which wavelengths are absorbed or reflected.	Covered in 6th and 8th grade Physics
	Something can be "seen" when light waves emitted or reflected enter the eye; just as something can be "heard" when sound waves enter the ear.	Covered in 8th grade Physiology
Energy	Energy is the ability to do work or to cause change. It occurs in different forms such as heat, chemical, mechanical, electrical, and light. 6 SB 2.1; 7 PSP 4	Covered most completely in 6th grade Physics; this concept is a part of all the Physics blocks.
	Energy that is stored is called potential energy (e.g. position, chemical). Energy that is in motion is called kinetic energy.	Not commonly taught in the K-8 Waldorf curriculum. It would make the most sense to add this concept to the 7th grade Physics block.
	Energy can change from one form to another. 7 SB 2.1; 8 SB 2.1	Transfer and motion of different types of energy is covered in the 6-8 Physics blocks.
	Energy can be neither created nor destroyed	Not commonly taught in the K-8 Waldorf curriculum. It would make the most sense to add this concept to the 7th grade Physics block.
	ASD Grade 8 IS Framework	Winterberry Science Blocks
Nature of science	The scientific method is a process people use to understand and predict natural phenomena. 8 SA 1.1; 8 SA 1.2	Covered in all science blocks 6-8

	Scientific principles are demonstrated in daily life. 8 SF 1.1 - SF 3.1	Covered in all science blocks 6-8
	LIFE SCIENCE	
Ecology	Food provides the fuel and the building materials for all organisms. The energy food provides moves through food chains via consumers, producers and decomposers. 7 SC 3.1; 7 SC 3.2	Covered in 7th and 8th grade Physiology; 8th grade Chemistry. See also 4th grade Zoology and 5th grade Botany, esp. for food chains.
	Over a time, matter is transformed from one organism to another and between organisms and their physical environment. As in all material systems, the total amount of matter remains constant, even though its form and location changes. 7 SC 3.1; 8 SC 3.1; 8 SC 3.2	Covered in 5th Botany; 6th Geology
	Two types of organisms may interact with one another, in several ways: they may be in a producer/consumer, predator/prey, parasite/host relationship, or one organism may scavenge or decompose another. 7 SC 3.2; 8 SC 3.2	Covered in 4th grade Zoology and 5th grade Botany.
	In all environments organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter (together referred to as "habitat"). 8 SC 3.2	Not usually covered in the Waldorf K-8 curriculum.
	Under normal conditions, organisms produce many more young than the environment can support, causing intense competition for available resources. 10 SC 3.2	Not usually covered in the Waldorf K-8 curriculum.
	Energy sources can be classified as renewable or nonrenewable. 8 SA 3.1	Covered in 6th grade Geology.
	Different methods of obtaining, transforming, and distributing energy have different environmental consequences. 8 SA 3.1	Partially covered in 6th grade Geology. The environmental impact of Industrialization is covered in 8th grade history.
	Changes in environmental conditions can affect the survival of individual organisms and entire species. Individual organisms with certain inherited and learned traits are more likely than others to survive and have offspring. Successful species are able to adapt to changes in their environment. 8 SC 2.2; 10 SC 1.2	Not usually covered in the Waldorf K-8 curriculum.

Genetics	In asexual reproduction, a single individual is the sole parent and passes copies of all its genetic material to the offspring. 7 SB 3.1; 10 SC 3.1	Covered in 5th grade Botany
	In sexual reproduction, a single, specialized cell from a female merges with a specialized cell from a male. The specific combination of DNA from each parent is what determines the probabilities of characteristics in the offspring. 7 SC 1.1; 8 SC 1.1; 9 SC 1.2; 10 SC 1.3	Covered in 7th grade Physiology
	Small differences between parents and offspring can accumulate (through selective breeding) in successive generations so those descendants are very different from their ancestors. 8 SC 1.1; 10 SC 1.3	Not usually covered in the Waldorf K-8 curriculum.
	New varieties of cultivated plants and domestic animals have resulted from selective breeding for particular traits. (artificial selection) 7 SC 1.2; 8 SC 1.1; 10 SC 1.3	Covered in 3rd grade? and 4th grade Geology, see also 5th grade Botany.
	EARTH SCIENCE	
Astro-nomy	The Solar System consists of planets that move around the Sun. Many of these planets have objects that orbit them. In addition to the planets, the solar system also includes asteroids and comets. 8 SD 4.1	Covered in 6th grade Astronomy
	Planets in the Solar System have different compositions and conditions. 8 SD 4.1	Covered in 6th grade Astronomy
	The light-year is used to measure vast distances in space. 7 SD 4.2	Covered in 6th grade Astronomy
	Stars have unique characteristics. Brightness of stars is determined by the size, temperature and distance the star is from Earth. 7 SD 4.1; 8 SD 4.2	Covered in 6th grade Astronomy
	The Sun's gravitational pull holds Earth and other planets in their orbits, just as the planets gravitational pull keeps their moons in orbit around them. 7 SD 4.1	Covered in 6th grade Astronomy
	Man's understanding of Earth's place in the universe has changed. Technological advancements have driven this understanding. 7 SG 3.1; 8 SG 3.1	Covered in 6th grade Astronomy; see also History blocks
Geology	Heat flow and movement of material within the earth cause earthquakes and volcanic eruptions and create	Covered in 6th grade Geology

	mountains and ocean basins. 8 SD 2.2	
	Geological features are a result of the geologic processes that drive the rock cycle. Some changes in the earth's surface are abrupt (such as earthquakes and volcanic eruptions) while other changes happen very slowly (such as uplift and wearing down of mountains, chemical and physical weathering). 8 SD 1.1; 7 SD 2.2	Covered in 6th grade Geology
Geology (cont.)	As water moves over the earth's surface, erosion occurs changing land formations. 7 SD 1.2; 8 SD 1.2	Covered in 6th grade Geology
	Topographic maps show surface features of an area. 8 SD 2.1	Covered in 6th grade Geology, also 4th grade Geography
	Although weathered rock is the basic component of soil, the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, rodents, and other organisms. 6 SD 2.1	Covered in 6th grade Geology; see also 5th grade Botany
	People can implement a variety of methods to mitigate erosion caused by water and wind movement and human influence on Earth's surface. 7 SD 2.1	Covered in 6th grade Geology
	PHYSICAL SCIENCE-- CHEMISTRY	
Atoms	On the Periodic Table, the elements are grouped into families that share common properties. 10 SB 1.1	Not commonly taught until grades 9-12 in Waldorf schools. Could be integrated into the 8th grade Chemistry Block
	Atoms combine by forming different kinds of bonds between and among themselves. 8 SB 3.2; 9 SB 3.1	Not commonly taught until grades 9-12 in Waldorf schools. Could be integrated into the 8th grade Chemistry Block
	In a closed system matter is conserved. In a chemical reaction matter is neither created nor destroyed, thus the mass remains the same.	Not explicitly taught, but is a clear extension of 7th grade Chemistry block.
Matter Has Measur-able Proper-ties	Substances have characteristic chemical properties such as pH and reactivity. 8 SB 1.1	Covered in 7th grade Chemistry
	During chemical change atoms in compounds separate and recombine to form new compounds that have different properties. These chemical reactions involve energy changes. 9 SB 3.1; 9 SB 3.2	Not commonly taught until grades 9-12 in Waldorf schools. Could be integrated into the 8th grade Chemistry Block