Virginia Standards of Learning Alignment

English (2017)

Legend

●	The standard is clearly addressed by program activities.
-	This standard potentially could be addressed as part of *FIRST*® LEGO® League Challenge either by actions that the coach or teacher takes when working with the students or by conditions established by the program.

Grade 4

Cluster	Indicator	Indicator Statement	Addressed
Communication and Multimodal Literacies	4.1	The student will use effective oral communication skills in a variety of settings.	●
	4.2	The student will create and deliver multimodal, interactive presentations.	●
	4.3	The student will learn how media messages are constructed and for what purposes.	-
Reading	4.4	The student will expand vocabulary when reading.	●
	4.5	The student will read and demonstrate comprehension of fictional texts, literary nonfiction texts, and poetry.	-
	4.6	The student will read and demonstrate comprehension of nonfiction texts.	-
Writing	4.7	The student will write in a variety of forms to include narrative, descriptive, opinion, and expository.	-
	4.8	The student will self- and peer-edit writing for capitalization, spelling, punctuation, sentence structure, paragraphing, and Standard English.	-
Research	4.9	The student will demonstrate comprehension of information resources to create a research product.	●

Grade 5

Cluster	Indicator	Indicator Statement	Addressed
Communication and Multimodal Literacies	5.1	The student will use effective oral communication skills in a variety of settings.	●
	5.2	The student will create multimodal presentations that effectively communicate ideas.	●
	5.3	The student will learn how media messages are constructed and for what purposes.	-
Reading	5.4	The student will expand vocabulary when reading.	●
	5.5	The student will read and demonstrate comprehension of fictional texts, literary nonfiction texts, and poetry.	-
	5.6	The student will read and demonstrate comprehension of nonfiction texts.	-
Writing	5.7	The student will write in a variety of forms to include narrative, descriptive, expository, and persuasive.	-
	5.8	The student will self- and peer-edit writing for capitalization, spelling, punctuation, sentence structure, paragraphing, and Standard English.	-
Research	5.9	The student will find, evaluate, and select appropriate resources to create a research product.	●

Grade 6

Cluster	Indicator	Indicator Statement	Addressed
Communication and Multimodal Literacies	6.1	The student will use effective oral communication skills in a variety of settings.	●
	6.2	The student will create multimodal presentations that effectively communicate ideas.	●
	6.3	The student will determine the purpose of media messages and examine how they are constructed.	-

Reading	6.4	The student will read and determine the meanings of unfamiliar words and phrases within authentic texts.	-
	6.5	The student will read and demonstrate comprehension of a variety of fictional texts, literary nonfiction texts, and poetry.	-
	6.6	The student will read and demonstrate comprehension of a variety of nonfiction texts.	-
Writing	6.7	The student will write in a variety of forms to include narrative, expository, persuasive, and reflective with an emphasis on narrative and reflective writing.	-
	6.8	The student will self- and peer-edit writing for capitalization, spelling, punctuation, sentence structure, paragraphing, and Standard English.	-
Research	6.9	The student will find, evaluate, and select appropriate resources to create a research product.	●

Grade 7

Cluster	Indicator	Indicator Statement	Addressed
Communication and Multimodal Literacies	7.1	The student will participate in and contribute to conversations, group discussions, and oral presentations.	●
	7.2	The student will create multimodal presentations both individually and in a group that effectively communicate ideas.	●
	7.3	The student will examine the elements of media literacy.	-
Reading	7.4	The student will read and determine the meanings of unfamiliar words and phrases within authentic texts.	-
	7.5	The student will read and demonstrate comprehension of a variety of fictional texts, literary nonfiction, poetry, and drama.	-
	7.6	The student will read and demonstrate comprehension of a variety of nonfiction texts.	-
Writing	7.7	The student will write in a variety of forms to include narrative, expository, persuasive, and reflective with an emphasis on expository and persuasive writing.	-
	7.8	The student will self- and peer-edit writing for capitalization, punctuation, spelling, sentence structure, paragraphing, and Standard English.	-
Research	7.9	The student will find, evaluate, and select appropriate resources to create a research product.	●

Grade 8

Cluster	Indicator	Indicator Statement	Addressed
Communication and Multimodal Literacies	8.1	The student will participate in, collaborate in, and report on small-group learning activities.	●
	8.2	The student will develop and deliver multimodal, interactive presentations collaboratively and individually.	●
	8.3	The student will analyze, develop, and produce creative or informational media messages.	-
Reading	8.4	The student will apply knowledge of word origins, and figurative language to extend vocabulary development within authentic texts.	-
	8.5	The student will read and analyze a variety of fictional texts, literary nonfiction, poetry, and drama.	-
	8.6	The student will read, comprehend, and analyze a variety of nonfiction texts.	-
Writing	8.7	The student will write in a variety of forms to include narrative, expository, persuasive, and reflective with an emphasis on expository and persuasive writing.	-
	8.8	The student will self- and peer-edit writing for capitalization, punctuation, spelling, sentence structure, paragraphing, and Standard English.	-
Research	8.9	The student will find, evaluate, select, and synthesize appropriate resources to produce a research product.	●

Virginia Standards of Learning Alignment
Mathematics (2016)

Legend

●	The standard is clearly addressed by program activities.
-	This standard potentially could be addressed as part of *FIRST*® LEGO® League Challenge either by actions that the coach or teacher takes when working with the students or by conditions established by the program.

Grade 4

Cluster	Indicator	Indicator Statement	Addressed
Number and Number Sense	4.1	The student will a. read, write, and identify the place and value of each digit in a nine-digit whole number; b. compare and order whole numbers expressed through millions; and c. round whole numbers expressed through millions to the nearest thousand, ten thousand, and hundred thousand.	-
	4.2	The student will a. compare and order fractions and mixed numbers, with and without models; b. represent equivalent fractions; and c. identify the division statement that represents a fraction, with models and in context.	
	4.3	The student will a. read, write, represent, and identify decimals expressed through thousandths; b. round decimals to the nearest whole number; c. compare and order decimals; and d. given a model, write the decimal and fraction equivalents.	-
Computation and Estimation	4.4	The student will a. demonstrate fluency with multiplication facts through 12 x 12, and the corresponding division facts; b. estimate and determine sums, differences, and products of whole numbers; c. estimate and determine quotients of whole numbers, with and without remainders; and d. create and solve single-step and multistep practical problems involving addition, subtraction, and multiplication, and single-step practical problems involving division with whole numbers.	
	4.5	The student will a. determine common multiples and factors, including least common multiple and greatest common factor; b. add and subtract fractions and mixed numbers having like and unlike denominators; and c. solve single-step practical problems involving addition and subtraction with fractions and mixed numbers.	
	4.6	The student will a. add and subtract with decimals; and b. solve single-step and multistep practical problems involving addition and subtraction with decimals.	-
	4.7	The student will solve practical problems that involve determining perimeter and area in U.S. Customary and metric units.	-

Cluster	Indicator	Indicator Statement	Addressed
Measurement and Geometry	4.8	The student will a. estimate and measure length and describe the result in U.S. Customary and metric units; b. estimate and measure weight/mass and describe the result in U.S. Customary and metric units; c. given the equivalent measure of one unit, identify equivalent measures of length, weight/mass, and liquid volume between units within the U.S. Customary system; and d. solve practical problems that involve length, weight/mass, and liquid volume in U.S. Customary units.	-
	4.9	The student will solve practical problems related to elapsed time in hours and minutes within a 12-hour period.	-
	4.10	The student will a. identify and describe points, lines, line segments, rays, and angles, including endpoints and vertices; and b. identify and describe intersecting, parallel, and perpendicular lines.	-
	4.11	The student will identify, describe, compare, and contrast plane and solid figures according to their characteristics (number of angles, vertices, edges, and the number and shape of faces) using concrete models and pictorial representations.	-
	4.12	The student will classify quadrilaterals as parallelograms, rectangles, squares, rhombi, and/or trapezoids.	-
Probability and Statistics	4.13	The student will a. determine the likelihood of an outcome of a simple event; b. represent probability as a number between 0 and 1, inclusive; and c. create a model or practical problem to represent a given probability.	-
	4.14	The student will a. collect, organize, and represent data in bar graphs and line graphs; b. interpret data represented in bar graphs and line graphs; and c. compare two different representations of the same data (e.g., a set of data displayed on a chart and a bar graph, a chart and a line graph, or a pictograph and a bar graph).	-
Patterns, Functions, and Algebra	4.15	The student will identify, describe, create, and extend patterns found in objects, pictures, numbers, and tables.	-
	4.16	The student will recognize and demonstrate the meaning of equality in an equation.	

Grade 5

Cluster	Indicator	Indicator Statement	Addressed
Number and Number Sense	5.1	The student, given a decimal through thousandths, will round to the nearest whole number, tenth, or hundredth.	-
	5.2	The student will a. represent and identify equivalencies among fractions and decimals, with and without models; and b. compare and order fractions, mixed numbers, and/or decimals in a given set, from least to greatest and greatest to least.	
	5.3	The student will a. identify and describe the characteristics of prime and composite numbers; and b. identify and describe the characteristics of even and odd numbers.	-
Computation and Estimation	5.4	The student will create and solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of whole numbers.	-
	5.5	The student will a. estimate and determine the product and quotient of two numbers involving decimals; and b. create and solve single-step and multistep practical problems involving addition, subtraction, and multiplication of decimals, and create and solve single-step practical problems involving division of decimals.	-
	5.6	The student will	-

Cluster	Indicator	Indicator Statement	Addressed
		a. solve single-step and multistep practical problems involving addition and subtraction with fractions and mixed numbers; and b. solve single-step practical problems involving multiplication of a whole number, limited to 12 or less, and a proper fraction, with models.	
	5.7	The student will simplify whole number numerical expressions using the order of operations.	
Measurement and Geometry	5.8	The student will a. solve practical problems that involve perimeter, area, and volume in standard units of measure; and b. differentiate among perimeter, area, and volume and identify whether the application of the concept of perimeter, area, or volume is appropriate for a given situation.	-
	5.9	The student will a. given the equivalent measure of one unit, identify equivalent measurements within the metric system; and b. solve practical problems involving length, mass, and liquid volume using metric units.	-
	5.10	The student will identify and describe the diameter, radius, chord, and circumference of a circle.	-
	5.11	The student will solve practical problems related to elapsed time in hours and minutes within a 24-hour period.	-
	5.12	The student will classify and measure right, acute, obtuse, and straight angles.	-
	5.13	The student will a. classify triangles as right, acute, or obtuse and equilateral, scalene, or isosceles; and b. investigate the sum of the interior angles in a triangle and determine an unknown angle measure.	-
	5.14	The student will recognize and apply transformations, such as translation, reflection, and rotation; and investigate and describe the results of combining and subdividing polygons.	
Probability and Statistics	5.15	The student will determine the probability of an outcome by constructing a sample space or using the Fundamental (Basic) Counting Principle.	-
	5.16	The student, given a practical problem, will a. represent data in line plots and stem-and-leaf plots; b. interpret data represented in line plots and stem-and-leaf plots; and c. compare data represented in a line plot with the same data represented in a stem-and-leaf plot.	-
	5.17	The student, given a practical context, will a. describe mean, median, and mode as measures of center; b. describe mean as fair share; c. describe the range of a set of data as a measure of spread; and d. determine the mean, median, mode, and range of a set of data.	-
Patterns, Functions, and Algebra	5.18	The student will identify, describe, create, express, and extend number patterns found in objects, pictures, numbers and tables.	-
	5.19	The student will a. investigate and describe the concept of variable; b. write an equation to represent a given mathematical relationship, using a variable; c. use an expression with a variable to represent a given verbal expression involving one operation; and d. create a problem situation based on a given equation, using a single variable and one operation.	-

Grade 6

Cluster	Indicator	Indicator Statement	Addressed
Number and Number Sense	6.1	The student will represent relationships between quantities using ratios, and will use appropriate notations, such as $\frac{a}{b}$, a to b, and a:b.	-
	6.2	The student will	-

		The student will	
		a. represent and determine equivalencies among fractions, mixed numbers, decimals, and percents; and	
		b. compare and order positive rational numbers.	
	6.3	The student will	-
		a. identify and represent integers;	
		b. compare and order integers; and	
		c. identify and describe absolute value of integers.	
	6.4	The student will recognize and represent patterns with whole number exponents and perfect squares.	-
Computation and Estimation	6.5	The student will	-
		a. multiply and divide fractions and mixed numbers;	
		b. solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of fractions and mixed numbers; and	
		c. solve multistep practical problems involving addition, subtraction, multiplication, and division of decimals.	
	6.6	The student will	-
		a. add, subtract, multiply, and divide integers;	
		b. solve practical problems involving operations with integers; and	
		c. simplify numerical expressions involving integers.	
Measurement and Geometry	6.7	The student will	-
		a. derive π (pi);	
		b. solve problems, including practical problems, involving circumference and area of a circle; and	
		c. solve problems, including practical problems, involving area and perimeter of triangles and rectangles.	
	6.8	The student will	-
		a. identify the components of the coordinate plane; and	
		b. identify the coordinates of a point and graph ordered pairs in a coordinate plane.	
	6.9	The student will determine congruence of segments, angles, and polygons.	-
Probability and Statistics	6.10	The student will	-
		a. represent data in a circle graph;	
		b. make observations and inferences about data represented in a circle graph; and	
		c. compare circle graphs with the same data represented in bar graphs, pictographs, and line plots.	
	6.11	The student will	-
		a. represent the mean of a data set graphically as the balance point; and	
		b. determine the effect on measures of center when a single value of a data set is added, removed, or changed.	
Patterns, Functions, and Algebra	6.12	The student will	-
		a. represent a proportional relationship between two quantities, including those arising from practical situations;	
		b. determine the unit rate of a proportional relationship and use it to find a missing value in a ratio table;	
		c. determine whether a proportional relationship exists between two quantities; and	
		d. make connections between and among representations of a proportional relationship between two quantities using verbal descriptions, ratio tables, and graphs.	
	6.13	The student will solve one-step linear equations in one variable, including practical problems that require the solution of a one-step linear equation in one variable.	
	6.14	The student will	
		a. represent a practical situation with a linear inequality in one variable; and	
		b. solve one-step linear inequalities in one variable, involving addition or subtraction, and graph the solution on a number line.	

Grade 7

Cluster	Indicator	Indicator Statement	Addressed
Number and Number Sense	7.1	The student will a. investigate and describe the concept of negative exponents for powers of ten; b. compare and order numbers greater than zero written in scientific notation; c. compare and order rational numbers; d. determine square roots of perfect squares; and e. identify and describe absolute value of rational numbers.	-
Computation and Estimation	7.2	The student will solve practical problems involving operations with rational numbers.	-
	7.3	The student will solve single-step and multistep practical problems, using proportional reasoning.	-
Measurement and Geometry	7.4	The student will a. describe and determine the volume and surface area of rectangular prisms and cylinders; and b. solve problems, including practical problems, involving the volume and surface area of rectangular prisms and cylinders.	-
	7.5	The student will solve problems, including practical problems, involving the relationship between corresponding sides and corresponding angles of similar quadrilaterals and triangles.	-
	7.6	The student will a. compare and contrast quadrilaterals based on their properties; and b. determine unknown side lengths or angle measures of quadrilaterals.	-
	7.7	The student will apply translations and reflections of right triangles or rectangles in the coordinate plane.	-
Probability and Statistics	7.8	The student will a. determine the theoretical and experimental probabilities of an event; and b. investigate and describe the difference between the experimental probability and theoretical probability of an event.	-
	7.9	The student will a. represent data in a histogram; b. make observations and inferences about data represented in a histogram; and c. compare histograms with the same data represented in stem-and-leaf plots, line plots, and circle graphs.	-
Patterns, Functions, and Algebra	7.10	The student will a. determine the slope, m, as rate of change in a proportional relationship between two quantities and write an equation in the form y = mx to represent the relationship; b. graph a line representing a proportional relationship between two quantities given the slope and an ordered pair, or given the equation in y = mx¬ form where m represents the slope as rate of change; c. determine the y-intercept, b, in an additive relationship between two quantities and write an equation in the form y = x + b to represent the relationship; d. graph a line representing an additive relationship between two quantities given the y-intercept and an ordered pair, or given the equation in the form y = x + b, where b represents the y-intercept; and e. make connections between and among representations of a proportional or additive relationship between two quantities using verbal descriptions, tables, equations, and graphs.	-
	7.11	The student will evaluate algebraic expressions for given replacement values of the variables.	-
	7.12	The student will solve two-step linear equations in one variable, including practical problems that require the solution of a two-step linear equation in one variable.	
	7.13	The student will solve one- and two-step linear inequalities in one variable, including practical problems, involving addition, subtraction, multiplication, and division, and graph the solution on a number line.	

Grade 8

Cluster	Indicator	Indicator Statement	Addressed
Number and Number Sense	8.1	The student will compare and order real numbers.	
	8.2	The student will describe the relationships between the subsets of the real number system.	

	8.3	The student will
		   a. estimate and determine the two consecutive integers between which a square root lies; and
		   b. determine both the positive and negative square roots of a given perfect square.	

Computation and Estimation	8.4	The student will solve practical problems involving consumer applications.	-
Measurement and Geometry	8.5	The student will use the relationships among pairs of angles that are vertical angles, adjacent angles, supplementary angles, and complementary angles to determine the measure of unknown angles.	

	8.6	The student will
		   a. solve problems, including practical problems, involving volume and surface area of cones and square-based pyramids; and
		   b. describe how changing one measured attribute of a rectangular prism affects the volume and surface area
			-

	8.7	The student will
		   a. given a polygon, apply transformations, to include translations, reflections, and dilations, in the coordinate plane; and
		   b. identify practical applications of transformations.	

	8.8	The student will construct a three-dimensional model, given the top or bottom, side, and front views.	-

	8.9	The student will
		   a. verify the Pythagorean Theorem; and
		   b. apply the Pythagorean Theorem.
			-

	8.10	The student will solve area and perimeter problems, including practical problems, involving composite plane figures.	-

Probability and Statistics	8.11	The student will
		   a. compare and contrast the probability of independent and dependent events; and
		   b. determine probabilities for independent and dependent events.
			-

	8.12	The student will
		   a. represent numerical data in boxplots;
		   b. make observations and inferences about data represented in boxplots; and
		   c. compare and analyze two data sets using boxplots.
			-

	8.13	The student will
		   a. represent data in scatterplots;
		   b. make observations about data represented in scatterplots; and
		   c. use a drawing to estimate the line of best fit for data represented in a scatterplot.
			-

Patterns, Functions, and Algebra	8.14	The student will
		   a. evaluate an algebraic expression for given replacement values of the variables; and
		   b. simplify algebraic expressions in one variable.
			-

	8.15	The student will
		   a. determine whether a given relation is a function; and
		   b. determine the domain and range of a function.
			-

	8.16	The student will
		   a. recognize and describe the graph of a linear function with a slope that is positive, negative, or zero;
		   b. identify the slope and y-intercept of a linear function, given a table of values, a graph, or an equation in $y = mx + b$ form;
		   c. determine the independent and dependent variable, given a practical situation modeled by a linear function;
		   d. graph a linear function given the equation in $y = mx + b$ form; and
			-

		e. make connections between and among representations of a linear function using verbal descriptions, tables, equations, and graphs.	
	8.17	The student will solve multistep linear equations in one variable with the variable on one or both sides of the equation, including practical problems that require the solution of a multistep linear equation in one variable.	
	8.18	The student will solve multistep linear inequalities in one variable with the variable on one or both sides of the inequality symbol, including practical problems, and graph the solution on a number line.	

Virginia Standards of Learning Alignment

Science

Legend

●	The standard is clearly addressed by program activities.
-	This standard potentially could be addressed as part of *FIRST*® LEGO® League Challenge either by actions that the coach or teacher takes when working with the students or by conditions established by the program.

Grade 4

Cluster	Indicator	Indicator Statement	Addressed
Scientific and Engineering Practices	4.1	The student will demonstrate an understanding of scientific and engineering practices by	●
	4.1.a	*asking questions and defining problems* • *identify scientific and non-scientific questions* • *develop hypotheses as cause-and-effect relations* • *define a simple design problem that can be solved through the development of an object, tool, process, or system*	●
	4.1.b	*planning and carrying out investigations* • *identify variables when planning an investigation* • *collaboratively plan and conduct investigations* • *use tools and/or materials to design and/or build a device that solves a specific problem* • *take metric measurements using appropriate tools* • *measure elapsed time*	●
	4.1.c	*interpreting, analyzing, and evaluating data* • *organize and represent data in bar graphs and line graphs* • *interpret and analyze data represented in bar graphs and line graphs* • *compare two different representations of the same data (e.g., a set of data displayed on a chart and a graph)* • *analyze data from tests of an object or tool to determine whether it works as intended*	-
	4.1.d	*constructing and critiquing conclusions and explanations* • *use evidence (i.e., measurements, observations, patterns) to construct or support explanations and to make inferences*	-
	4.1.e	*developing and using models* • *develop and/or use models to explain natural phenomena* • *identify limitations of models*	●
	4.1.f	*obtaining, evaluating, and communicating information* • *read and comprehend reading-level-appropriate texts and/or other reliable media* • *communicate scientific information, design ideas, and/or solutions with others*	●
Living Systems and Processes	4.2	The student will investigate and understand that plants and animals have structures that distinguish them from one another and play vital roles in their ability to survive.	
	4.3	The student will investigate and understand that organisms, including humans, interact with one another and with the nonliving components in the ecosystem.	
Earth and Space Systems	4.4	The student will investigate and understand that weather conditions and phenomena affect ecosystems and can be predicted.	
	4.5	The student will investigate and understand that the planets have characteristics and a specific place in the solar system.	
	4.6	The student will investigate and understand that there are relationships among Earth, the moon, and the sun.	
	4.7	The student will investigate and understand that the ocean environment has characteristics.	

| Earth Resources | 4.8 | The student will investigate and understand that Virginia has important natural resources. | - |

Grade 5

Cluster	Indicator	Indicator Statement	Addressed
Scientific and Engineering Practices	5.1	The student will demonstrate an understanding of scientific and engineering practices by	●
	5.1.a	*asking questions and defining problems* • *ask testable questions based on observations and predict reasonable outcomes based on patterns* • *develop hypotheses as cause-and-effect relationship* • *define design problems that can be solved through the development of an object, tool, process, or system*	●
	5.1.b	*planning and carrying out investigations* • *collaboratively plan and conduct investigations to produce data* • *identify independent variable, dependent variables, and constants* • *determine data that should be collected to answer a testable question* • *take¬ metric measurements using appropriate tools* • *use tools and/or materials to design and/or build a device that solves a specific problem*	●
	5.1.c	*interpreting, analyzing, and evaluating data* • *represent and analyze data using tables and graphs* • *organize simple data sets to reveal patterns that suggest relationships* • *compare and contrast data collected by different groups and discuss similarities and differences in their findings* • *use data to evaluate and refine design solutions*	●
	5.1.d	*constructing and critiquing conclusions and explanations* • *construct and/or support arguments with evidence, data, and/or a model* • *describe how scientific ideas apply to design solutions* • *generate and compare multiple solutions to problems based on how well they meet the criteria and constraints*	●
	5.1.e	*developing and using models* • *develop models using an analogy, example, or abstract representation to describe a scientific principle or design solution* • *identify limitations of models*	●
	5.1.f	*obtaining, evaluating, and communicating information* • *read and comprehend reading-level-appropriate texts and/or other reliable media* • *communicate scientific information, design ideas, and/or solutions with others*	●
Force, Motion, and Energy	5.2	The student will investigate and understand that energy can take many forms.	-
	5.3	The student will investigate and understand that there is a relationship between force and energy of moving objects.	-
	5.4	The student will investigate and understand that electricity is transmitted and used in daily life.	
	5.5	The student will investigate and understand that sound can be produced and transmitted.	-
	5.6	The student will investigate and understand that visible light has certain characteristics and behaves in predictable ways.	-
Matter	5.7	The student will investigate and understand that matter has properties and interactions.	-
Earth and Space Systems	5.8	The student will investigate and understand that Earth constantly changes.	
Earth Resources	5.9	The student will investigate and understand that the conservation of energy resources is important.	-

Grade 6

Indicator	Indicator Statement	Addressed
6.1	The student will demonstrate an understanding of scientific and engineering practices by	●
6.1.a	*asking questions and defining problems* • *ask questions to determine relationships between independent and dependent variables* • *develop hypotheses and identify independent and dependent variables* • *offer simple solutions to design problems*	●
6.1.b	*planning and carrying out investigations* • *independently and collaboratively plan and conduct observational and experimental investigations; identify variables, constants, and controls where appropriate, and include the safe use of chemicals and equipment* • *evaluate the accuracy of various methods for collecting data* • *take metric measurements using appropriate tools* • *use tools and materials to design and/or build a device to solve a specific problem*	●
6.1.c	*interpreting, analyzing, and evaluating data* • *organize data sets to reveal patterns that suggest relationships* • *construct, analyze, and interpret graphical displays of data* • *compare and contrast data collected by different groups and discuss similarities and differences in findings* • *use data to evaluate and refine design solutions*	●
6.1.d	*constructing and critiquing conclusions and explanations* • *construct explanations that includes qualitative or quantitative relationships between variables* • *construct scientific explanations based on valid and reliable evidence obtained from sources (including the students' own investigations)* • *generate and compare multiple solutions to problems based on how well they meet the criteria and constraints*	●
6.1.e	*developing and using models* • *use scale models to represent and estimate distance* • *use, develop, and revise models to predict and explain phenomena* • *evaluate limitations of models*	●
6.1.f	*obtaining, evaluating, and communicating information* • *read scientific texts, including those adapted for classroom use, to obtain scientific and/or technical information* • *gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication* • *construct, use, and/or present an argument supported by empirical evidence and scientific reasoning*	●
6.2	The student will investigate and understand that the solar system is organized and the various bodies in the solar system interact.	
6.3	The student will investigate and understand that there is a relationship between the sun, Earth, and the moon.	
6.4	The student will investigate and understand that there are basic sources of energy and that energy can be transformed.	-
6.5	The student will investigate and understand that sound can be produced and transmitted.	-
6.6	The student will investigate and understand that all matter is composed of atoms.	
6.7	The student will investigate and understand that air has properties and that Earth's atmosphere has structure and is dynamic.	
6.8	The student will investigate and understand that land and water have roles in watershed systems.	
6.9	The student will investigate and understand that humans impact the environment and individuals can influence public policy decisions related to energy and the environment.	-

Physical Science

Indicator	Indicator Statement	Addressed
PS.1	The student will demonstrate an understanding of scientific and engineering practices by	●
PS.1.a	*asking questions and defining problems* • *ask questions that require empirical evidence to answer* • *develop hypotheses indicating relationships between independent and dependent variables* • *offer simple solutions to design problems*	●
PS.1.b	*planning and carrying out investigations*	●

	• *independently and collaboratively plan and conduct observational and experimental investigations; identify variables, constants, and controls where appropriate and include the safe use of chemicals and equipment* • *evaluate the accuracy of various methods for collecting data* • *take metric measurements using appropriate tools and technologies* • *apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system*	
PS.1.c	*interpreting, analyzing, and evaluating data* • *construct and interpret data tables showing independent and dependent variables, repeated trials, and means* • *construct, analyze, and interpret graphical displays of data and consider limitations of data analysis* • *apply mathematical concepts and processes to scientific questions* • *use data to evaluate and refine design solutions to best meet criteria*	●
PS.1.d	*constructing and critiquing conclusions and explanations* • *construct scientific explanations based on valid and reliable evidence obtained from sources (including the students' own investigations)* • *construct arguments supported by empirical evidence and scientific reasoning* • *generate and compare multiple solutions to problems based on how well they meet the criteria and constraints* • *differentiate between a scientific hypothesis, theory, and law*	●
PS.1.e	*developing and using models* • *construct, develop, and use models and simulations to illustrate and/or explain observable and unobservable phenomena* • *evaluate limitations of models*	●
PS.1.f	*obtaining, evaluating, and communicating information* • *read scientific texts, including those adapted for classroom use, to determine the central idea and/or obtain scientific and/or technical information* • *gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication* • *construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning*	●
PS.2	The student will investigate and understand that matter is composed of atoms.	
PS.3	The student will investigate and understand that matter has properties and is conserved in chemical and physical processes.	
PS.4	The student will investigate and understand that the periodic table is a model used to organize elements based on their atomic structure.	
PS.5	The student will investigate and understand that energy is conserved.	-
PS.6	The student will investigate and understand that waves are important in the movement of energy.	-
PS.7	The student will investigate and understand that electromagnetic radiation has characteristics.	
PS.8	The student will investigate and understand that work, force, and motion are related.	-
PS.9	The student will investigate and understand that there are basic principles of electricity and magnetism.	-

Virginia Standards of Learning Alignment

Computer Science (2017)

Legend

●	The standard is clearly addressed by program activities.
-	This standard potentially could be addressed as part of *FIRST*® LEGO® League Challenge either by actions that the coach or teacher takes when working with the students or by conditions established by the program.

Grade 4

Cluster	Indicator	Indicator Statement	Addressed
Algorithms and Programming	4.1	The student will construct sets of step-by-step instructions (algorithms) both independently and collaboratively a. using sequencing; b. using loops; c. using variables to store and process data; and d. performing number calculations on variables (e.g., addition, subtraction, multiplication and division).	●
	4.2	The student will construct programs to accomplish tasks as a means of creative expression using a block or text based programming language, both independently and collaboratively a. using sequencing; b. using loops; c. using variables; and d. performing number calculations (e.g., addition, subtraction, multiplication and division) on variables.	●
	4.3	The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, loops and variables.	●
	4.4	The student will create a plan as part of the iterative design process, both independently and collaboratively using strategies such as pair programming (e.g., storyboard, flowchart, pseudocode, story map).	●
	4.5	The student will classify and arrange a group of items based on the attributes or actions.	-
	4.6	The student will break down (decompose) a larger problem into smaller sub-problems, both independently and collaboratively.	●
	4.7	The student will give credit to sources when borrowing or changing ideas (e.g., using information, pictures created by others, using music created by others, remixing programming projects).	●
Computing Systems	4.8	The student will model how a computing system works including input and output, processors, and sensors.	-
	4.9	The student will identify, using accurate terminology, simple hardware and software problems that may occur during use, and apply strategies for solving problems (e.g., rebooting the device, checking for power, checking for network availability, closing and reopening an app).	-
Cybersecurity	4.10	The student will identify and explain problems that relate to inappropriate use of computing devices and networks.	
	4.11	The student will create examples of strong passwords, explain why strong passwords should be used, and demonstrate proper use and protection of personal passwords.	
Data and Analysis	4.12	The student will use a computer to observe, analyze, and manipulate data in order to draw conclusions and make predictions.	-

	4.13	The student will create an artifact using computing systems to model the attributes and behaviors associated with a concept (e.g., solar system).	●
	4.14	The student will use numeric values to represent non-numeric ideas in the computer (binary, ASCII, pixel attributes such as RGB).	-
Impacts of Computing	4.15	The student will give examples of computing technologies that have changed the world and express how those technologies influence, and are influenced by, cultural practices.	-
	4.16	The student will describe the positive and negative impacts of the pervasiveness of computers and computing in daily life (e.g., downloading videos and audio files, electronic appliances, wireless Internet, mobile computing devices, GPS systems, wearable computing).	-
	4.17	The student will describe social and ethical issues that relate to computing devices and networks.	-
Networking and the Internet	4.18	The student will identify and explain different ways information can be transmitted using computing devices via a network (e.g., email, images, and videos).	-

Grade 5

Cluster	Indicator	Indicator Statement	Addressed

Algorithms and Programming	5.1	The student will construct sets of step-by-step instructions (algorithms) both independently and collaboratively
		   a. using sequencing;
		   b. using loops;
		   c. using variables to store and process data;
		   d. performing number calculations on variables (addition, subtraction, multiplication and division); and
		   e. using conditionals (if-statements).
			●

	5.2	The student will construct programs to accomplish tasks as a means of creative expression using a block or text based programming language, both independently and collaboratively
		   a. using sequencing;
		   b. using loops;
		   c. using variables;
		   d. using mathematical operations (addition, subtraction, multiplication and division) variable to manipulate a variable; and
		   e. using conditionals (if-statements).
			●

	5.3	The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, loops, conditionals, and variables.	●
	5.4	The student will create a plan as part of the iterative design process, both independently and collaboratively using different strategies (e.g., pair programming, storyboard, flowchart, pseudocode, story map).	●
	5.5	The student will break down (decompose) a larger problem into smaller sub-problems, both independently and collaboratively.	●
	5.6	The student will give credit to sources when borrowing or changing ideas (e.g., using information, pictures created by others, using music created by others, remixing programming projects).	●
Computing Systems	5.7	The student will model how a computing system works including input and output, processors, and sensors.	-
	5.8	The student will identify, using accurate terminology, simple hardware and software problems that may occur during use, and apply strategies for solving problems (e.g., rebooting the device, checking for power, checking for network availability, closing and reopening an app).	-

Cluster	Indicator	Indicator Statement	Addressed
Cybersecurity	5.9	The student will evaluate and solve problems that relate to inappropriate use of computing devices and networks.	-
	5.10	The student will determine whether passwords are strong, explain why strong passwords should be used, and demonstrate proper use and protection of personal passwords.	-
Data and Analysis	5.11	The student will use a computer to observe, analyze, and manipulate data in order to draw conclusions and make predictions.	-
	5.12	The student will create an artifact using computing systems to model the attributes and behaviors associated with a concept (e.g., plate tectonics).	●
	5.13	The student will use numeric values to represent non-numeric ideas in the computer (binary, ASCII, pixel attributes such as RGB).	-
Impacts of Computing	5.14	The student will give examples and explain how computer science has changed the world and express how computing technologies influence, and are influenced by, cultural practices.	-
	5.15	The student will evaluate and describe the positive and negative impacts of the pervasiveness of computers and computing in daily life (e.g., downloading videos and audio files, electronic appliances, wireless Internet, mobile computing devices, GPS systems, wearable computing).	-
	5.16	The student will explain social and ethical issues that relate to computing devices and networks.	-
Networking and the Internet	5.17	The student will compare and contrast the difference between a local network and a worldwide network.	-

Grade 6

Cluster	Indicator	Indicator Statement	Addressed
Algorithms and Programming	6.1	The student will construct programs to accomplish a task as a means of creative expression or scientific exploration using a block based or text based programming language, both independently and collaboratively, a. combining control structures such as if-statements and loops; and b. creating clearly named variables that represent different data types, including numeric and non-numeric data, and perform operations on their values.	●
	6.2	The student will trace programs to predict outcomes and debug (correct and improve) for correctness.	●
	6.3	The student will seek and incorporate feedback from team members and users to refine a program that meets user needs.	●
	6.4	The student will incorporate existing code, media, and libraries into original programs, and give attribution.	●
Computing Systems	6.5	The student will design projects that combine hardware and software components to collect and exchange data.	-
Cybersecurity	6.6	The student will identify physical and digital security measures used to protect electronic information.	-
Data and Analysis	6.7	The student will explain how binary sequences are used to represent digital data.	-
	6.8	The student will collect data using computational tools then clean and organize to make it more useful and reliable.	-
	6.9	The student will explain the insight and knowledge gained from digitally processed data by using appropriate visualizations.	-
	6.10	The student will use models and simulations to formulate, refine, and test hypotheses.	-
Impacts of Computing	6.11	The student will explain how computing has impacted innovations in other fields.	-
	6.12	The student will explore careers related to data.	-

Cluster	Indicator	Indicator Statement	Addressed
Networking and the Internet	6.13	The student will explain why the speed of data transmission across the Internet can vary depending on the type of data being transmitted.	-

Grade 7

Cluster	Indicator	Indicator Statement	Addressed
Algorithms and Programming	7.1	The student will construct programs to accomplish a task as a means of creative expression or scientific exploration using a block based or text based programming language, both independently and collaboratively, a. combining control structures such as if-statements and loops including compound conditionals; and b. creating clearly named variables that represent different data types, including numeric and non-numeric data, and perform operations on their values.	●
	7.2	The student will document programs to make them easier to follow, test, and debug.	●
	7.3	The student will distribute tasks and maintain a project timeline when collaboratively developing computational artifacts.	●
	7.4	The student will decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	●
Computing Systems	7.5	The student will describe how the Internet connects devices and networks all over the world.	-
Cybersecurity	7.6	The student will describe how physical and digital security measures protect electronic information.	-
	7.7	The student will identify existing cybersecurity concerns associated with Internet use and Internet-based systems and potential options to address these issues.	-
Data and Analysis	7.8	The student will discuss the correctness of a model representing a system by comparing the model's generated results with data that were observed in the system being modeled.	-
	7.9	The student will refine computational models based on the data they have generated.	-
Impacts of Computing	7.10	The student will explain how advances in technology have contributed to Virginia's prosperity and role in the global economy.	-
	7.11	The student will describe the development of new technologies in communication, entertainment, and business and their impact on American life.	-
	7.12	The student will explore careers related to the Internet.	-
Networking and the Internet	7.13	The student will outline the advantages and disadvantages of transmitting information over the Internet, including speed, reliability, cost, and security.	-
	7.14	The student will explain why protocols are necessary in data transmission. Model the role of protocols in transmitting data across networks and the Internet.	-
	7.15	The student will model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the Internet, and reassembled at the destination.	-

Grade 8

Cluster	Indicator	Indicator Statement	Addressed
Algorithms and Programming	8.1	The student will construct programs to accomplish a task as a means of creative expression or scientific exploration using a block based or text based programming language, both independently and collaboratively, a. combining control structures such as if-statements and loops including nested conditionals and loops;	●

		b. using clearly named variables that represent different data types, including numeric and non-numeric data, and perform operations on their values; and c. create procedures with parameters.	
	8.2	The student will systematically test and refine programs using a range of test cases.	●
	8.3	The student will explain how effective communication between participants is required for successful collaboration when developing programs.	●
	8.4	The student will use flowcharts and/or pseudocode to address complex problems as algorithms.	●
Computing Systems	8.5	The student will, using the elements of computing devices such as primary memory, secondary storage, processor, input and output devices, and network connectivity, analyze the advantages and limitations of a given computing system.	-
Cybersecurity	8.6	The student will evaluate physical and digital security measures used to protect electronic information.	-
	8.7	The student will identify impacts of hacking, ransomware, scams, fake vulnerability scans, and the ethical and legal concerns involved.	-
Data and Analysis	8.8	The student will a. explain the difference between a model and a simulation; and b. create computational models to conduct simulations.	-
Impacts of Computing	8.9	The student will describe tradeoffs between allowing information to be public and keeping information private.	-
	8.10	The student will evaluate online and print sources for appropriateness and credibility.	●
	8.11	The student will discuss the social impacts and ethical considerations associated with the field of cybersecurity.	-
	8.12	The student will explore careers related to the field of cybersecurity.	-
Networking and the Internet	8.13	The student will identify existing cybersecurity concerns associated with Internet use and Internet-based systems and potential options to address these issues.	-