Main Criteria: Forward

Secondary Criteria: Alabama Courses of Study, Alaska Content and Performance Standards, Arizona's College and Career Ready Standards, Arkansas Standards, California Content Standards, Colorado Academic Standards (CAS), Connecticut State Standards, Delaware Standards and Instruction, Florida Standards, Georgia Standards of Excellence, Hawaii Content and Performance Standards

Subjects: Mathematics, Science, Technology Education

Grade: 11

Forward

Autonomous Electric Vehicles of the Future

Alabama Courses of Study

Mathematics

Grade **11** - Adopted: **2019/Impl. 2020**

STRAND / DOMAIN		Mathematical Practices
OBJECTIVE / CATEGORY	MP1	Make sense of problems and persevere in solving them.
OBJECTIVE / CATEGORY	MP2	Reason abstractly and quantitatively.
OBJECTIVE / CATEGORY	MP3	Construct viable arguments and critique the reasoning of others.
OBJECTIVE / CATEGORY	MP4	Model with mathematics.
OBJECTIVE / CATEGORY	MP8	Look for and express regularity in repeated reasoning.

STRAND / DOMAIN		Geometry with Data Analysis Content Standards
OBJECTIVE / CATEGORY		**Algebra and Functions - Focus 2: Connecting Algebra to Functions**
STANDARD		**Graphs can be used to obtain exact or approximate solutions of equations, inequalities, and systems of equations and inequalities—including systems of linear equations in two variables and systems of linear and quadratic equations (given or obtained by using technology).**
RELATED CONTENT / EXPECTATION	5.	Verify that the graph of a linear equation in two variables is the set of all its solutions plotted in the coordinate plane, which forms a line.

STRAND / DOMAIN		Algebra I with Probability Content Standards
OBJECTIVE / CATEGORY		**Algebra and Functions - Focus 1: Algebra**
STANDARD		**Expressions, equations, and inequalities can be used to analyze and make predictions, both within mathematics and as mathematics is applied in different contexts – in particular, contexts that arise in relation to linear, quadratic, and exponential situations.**
RELATED CONTENT / EXPECTATION	12.	Create equations in two or more variables to represent relationships between quantities in context; graph equations on coordinate axes with labels and scales and use them to make predictions. Limit to contexts arising from linear, quadratic, exponential, absolute value, and linear piecewise functions.

STRAND / DOMAIN		Algebra I with Probability Content Standards

OBJECTIVE / CATEGORY		**Algebra and Functions - Focus 2: Connecting Algebra to Functions**
STANDARD		**Graphs can be used to obtain exact or approximate solutions of equations, inequalities, and systems of equations and inequalities – including systems of linear equations in two variables and systems of linear and quadratic equations (given or obtained by using technology).**
RELATED CONTENT / EXPECTATION	**19.**	**Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x).**
GRADE EXPECTATION	19.a.	Find the approximate solutions of an equation graphically, using tables of values, or finding successive approximations, using technology where appropriate. Note: Include cases where f(x) is a linear, quadratic, exponential, or absolute value function and g(x) is constant or linear.

STRAND / DOMAIN		**Algebra I with Probability Content Standards**
OBJECTIVE / CATEGORY		**Algebra and Functions - Focus 3: Functions**
STANDARD		**Functions that are members of the same family have distinguishing attributes (structure) common to all functions within that family.**
RELATED CONTENT / EXPECTATION	**24.**	**Distinguish between situations that can be modeled with linear functions and those that can be modeled with exponential functions.**
GRADE EXPECTATION	24.b.	Define linear functions to represent situations in which one quantity changes at a constant rate per unit interval relative to another.

STRAND / DOMAIN		**Algebra I with Probability Content Standards**
OBJECTIVE / CATEGORY		**Algebra and Functions - Focus 3: Functions**
STANDARD		**Functions that are members of the same family have distinguishing attributes (structure) common to all functions within that family.**
RELATED CONTENT / EXPECTATION	27.	Interpret the parameters of functions in terms of a context. Extend from linear functions, written in the form mx + b, to exponential functions, written in the form ab^x.

STRAND / DOMAIN		**Algebra I with Probability Content Standards**
OBJECTIVE / CATEGORY		**Algebra and Functions - Focus 3: Functions**
STANDARD		**Functions can be represented graphically and key features of the graphs, including zeros, intercepts, and, when relevant, rate of change and maximum/minimum values, can be associated with and interpreted in terms of the equivalent symbolic representation.**
RELATED CONTENT / EXPECTATION	**30.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
GRADE EXPECTATION	30.a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

STRAND / DOMAIN		**Algebra I with Probability Content Standards**
OBJECTIVE / CATEGORY		**Algebra and Functions - Focus 3: Functions**

STANDARD		**Functions model a wide variety of real situations and can help students understand the processes of making and changing assumptions, assigning variables, and finding solutions to contextual problems.**
RELATED CONTENT / EXPECTATION	31.	Use the mathematical modeling cycle to solve real-world problems involving linear, quadratic, exponential, absolute value, and linear piecewise functions.
STRAND / DOMAIN		**Mathematical Modeling Content Standards**
OBJECTIVE / CATEGORY		**Modeling**
STANDARD		**Mathematical modeling and statistical problem-solving are extensive, cyclical processes that can be used to answer significant real-world problems.**
RELATED CONTENT / EXPECTATION	1.	Use the full Mathematical Modeling Cycle or Statistical Problem-Solving Cycle to answer a real-world problem of particular student interest, incorporating standards from across the course.
STRAND / DOMAIN		**Mathematical Modeling Content Standards**
OBJECTIVE / CATEGORY		**Financial Planning and Management**
STANDARD		**Mathematical models involving growth and decay are useful in solving real-world problems involving borrowing and investing; spreadsheets are a frequently-used and powerful tool to assist with modeling financial situations.**
RELATED CONTENT / EXPECTATION	2.	Use elements of the Mathematical Modeling Cycle to solve real-world problems involving finances.

Alabama Courses of Study

Science

Grade **11** - Adopted: **2015**

STRAND / DOMAIN	**AL.HS.PS.**	**PHYSICAL SCIENCE**
OBJECTIVE / CATEGORY		**Matter and Its Interactions**
STANDARD	HS.PS.3.	Analyze and interpret data from a simple chemical reaction or combustion reaction involving main group elements.
STRAND / DOMAIN	**AL.HS.PS.**	**PHYSICAL SCIENCE**
OBJECTIVE / CATEGORY		**Waves and Their Applications in Technologies for Information Transfer**
STANDARD	HS.PS.15.	Obtain and communicate information from published materials to explain how transmitting and receiving devices (e.g., cellular telephones, medical-imaging technology, solar cells, wireless Internet, scanners, Sound Navigation and Ranging [SONAR]) use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.
STRAND / DOMAIN	**AL.HS.C.**	**CHEMISTRY**
OBJECTIVE / CATEGORY		**Energy**
STANDARD	**HS.C.11.**	**Construct an explanation that describes how the release or absorption of energy from a system depends upon changes in the components of the system.**

RELATED CONTENT / EXPECTATION	HS.C.11.a.	Develop a model to illustrate how the changes in total bond energy determine whether a chemical reaction is endothermic or exothermic.

STRAND / DOMAIN	**AL.HS.ES.**	**ENVIRONMENTAL SCIENCE**
OBJECTIVE / CATEGORY		**Earth and Human Activity**
STANDARD	HS.ES.1.	Investigate and analyze the use of nonrenewable energy sources (e.g., fossil fuels, nuclear, natural gas) and renewable energy sources (e.g., solar, wind, hydroelectric, geothermal) and propose solutions for their impact on the environment.
STANDARD	HS.ES.12.	Analyze and interpret data and climate models to predict how global or regional climate change can affect Earth's systems (e.g., precipitation and temperature and their associated impacts on sea level, glacial ice volumes, and atmosphere and ocean composition).
STANDARD	HS.ES.13.	Obtain, evaluate, and communicate information based on evidence to explain how key natural resources (e.g., water sources, fertile soils, concentrations of minerals and fossil fuels), natural hazards, and climate changes influence human activity (e.g., mass migrations).
STANDARD	HS.ES.14.	Analyze cost-benefit ratios of competing solutions for developing, conserving, managing, recycling, and reusing energy and mineral resources to minimize impacts in natural systems (e.g., determining best practices for agricultural soil use, mining for coal, and exploring for petroleum and natural gas sources).
STANDARD	HS.ES.15.	Construct an explanation based on evidence to determine the relationships among management of natural resources, human sustainability, and biodiversity (e.g., resources, waste management, per capita consumption, agricultural efficiency, urban planning).

Grade **11** - Adopted: **2014**

STRAND / DOMAIN	**AL.RH.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
OBJECTIVE / CATEGORY		**Key Ideas and Details**
STANDARD	RH.11-12.2.	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
STANDARD	RH.11-12.3.	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

STRAND / DOMAIN	**AL.RH.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
OBJECTIVE / CATEGORY		**Craft and Structure**
STANDARD	RH.11-12.4.	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to Grades 11-12 texts and topics.
STANDARD	RH.11-12.5.	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

STRAND / DOMAIN	**AL.RH.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**

OBJECTIVE / CATEGORY		**Integration of Knowledge and Ideas**
STANDARD	RH.11-12.9.	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
STRAND / DOMAIN	**AL.RH.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
OBJECTIVE / CATEGORY		**Range of Reading and Level of Text Complexity**
STANDARD	RH.11-12.10.	By the end of Grade 12, read and comprehend science/technical texts in the Grades 11-CCR text complexity band independently and proficiently.
STRAND / DOMAIN	**AL.WHST.11-12.**	**Writing Standards for Literacy in Science, and Technical Subjects**
OBJECTIVE / CATEGORY		**Text Types and Purposes**
STANDARD	**WHST.11-12.2.**	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**
RELATED CONTENT / EXPECTATION	WHST.11-12.2.d.	Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
STRAND / DOMAIN	**AL.WHST.11-12.**	**Writing Standards for Literacy in Science, and Technical Subjects**
OBJECTIVE / CATEGORY		**Production and Distribution of Writing**
STANDARD	WHST.11-12.4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
STANDARD	WHST.11-12.6.	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Alabama Courses of Study

Technology Education

Grade **11** - Adopted: **2018**

STRAND / DOMAIN	**AL.DLCS.9-12.**	**Digital Literacy and Computer Science**
OBJECTIVE / CATEGORY	**9-12.1.**	**Computational Thinker**
STANDARD		**Algorithms**
RELATED CONTENT / EXPECTATION	**9-12.1.3.**	**Differentiate between a generalized expression of an algorithm in pseudocode and its concrete implementation in a programming language.**
GRADE EXPECTATION	9-12.1.3.a.	Explain that some algorithms do not lead to exact solutions in a reasonable amount of time and thus approximations are acceptable.
GRADE EXPECTATION	9-12.1.3.c.	Distinguish when a problem solution requires decisions to be made among alternatives, such as selection constructs, or when a solution needs to be iteratively processed to arrive at a result, such as iterative “loop” constructs or recursion.

GRADE EXPECTATION	9-12.1.3.d.	Evaluate and select algorithms based on performance, reusability, and ease of implementation.
GRADE EXPECTATION	9-12.1.3.e.	Explain how more than one algorithm may solve the same problem and yet be characterized with different priorities.

STRAND / DOMAIN	**AL.DLCS.9-12.**	**Digital Literacy and Computer Science**
OBJECTIVE / CATEGORY	**9-12.1.**	**Computational Thinker**
STANDARD		**Algorithms**
RELATED CONTENT / EXPECTATION	9-12.1.4.	Use and adapt classic algorithms to solve computational problems.

STRAND / DOMAIN	**AL.DLCS.9-12.**	**Digital Literacy and Computer Science**
OBJECTIVE / CATEGORY	**9-12.5.**	**Innovative Designer**
STANDARD		**Human/Computer Partnerships**
RELATED CONTENT / EXPECTATION	9-12.5.39.	Identify a problem that cannot be solved by either humans or machines alone and discuss a solution for it by decomposing the task into sub-problems suited for a human or machine to accomplish.

Alaska Content and Performance Standards

Mathematics

Grade **11** - Adopted: **2012**

PERFORMANCE / CONTENT STANDARD	**AK.MP.**	**Mathematical Practices**
GRADE LEVEL EXPECTATION / STRAND	MP.1.	Make sense of problems and persevere in solving them.
GRADE LEVEL EXPECTATION / STRAND	MP.2.	Reason abstractly and quantitatively.
GRADE LEVEL EXPECTATION / STRAND	MP.3.	Construct viable arguments and critique the reasoning of others.
GRADE LEVEL EXPECTATION / STRAND	MP.4.	Model with mathematics.
GRADE LEVEL EXPECTATION / STRAND	MP.8.	Look for and express regularity in repeated reasoning.

PERFORMANCE / CONTENT STANDARD	**AK.HS.A.**	**Algebra**
GRADE LEVEL EXPECTATION / STRAND	**A-CED.**	**Creating Equations and Inequalities**
GOAL		**Create equations and inequalities that describe numbers or relationships.**
INDICATOR	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

PERFORMANCE / CONTENT STANDARD	**AK.HS.F.**	**Functions**
GRADE LEVEL EXPECTATION / STRAND	**F-IF.**	**Interpreting Functions**
GOAL		**Analyze functions using different representations.**
INDICATOR	**F-IF.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
INDICATOR	F-IF.7.a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

PERFORMANCE / CONTENT STANDARD	**AK.HS.F.**	**Functions**
GRADE LEVEL EXPECTATION / STRAND	**F-LE.**	**Linear, Quadratic, and Exponential Models**
GOAL		**Construct and compare linear, quadratic, and exponential models and solve problems**
INDICATOR	**F-LE.1.**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
INDICATOR	F-LE.1.a.	Show that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

PERFORMANCE / CONTENT STANDARD	**AK.HS.G.**	**Geometry**
GRADE LEVEL EXPECTATION / STRAND	**G-GPE.**	**Expressing Geometric Properties with Equations**
GOAL		**Use coordinates to prove simple geometric theorems algebraically.**
INDICATOR	G-GPE.5.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Alaska Content and Performance Standards

Science

Grade **11** - Adopted: **2019**

PERFORMANCE / CONTENT STANDARD		**HIGH SCHOOL PHYSICAL SCIENCES**

GRADE LEVEL EXPECTATION / STRAND		**Chemical Reactions**
GOAL	HS-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
PERFORMANCE / CONTENT STANDARD		**HIGH SCHOOL PHYSICAL SCIENCES**
GRADE LEVEL EXPECTATION / STRAND		**Energy**
GOAL	HS-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
PERFORMANCE / CONTENT STANDARD		**HIGH SCHOOL PHYSICAL SCIENCES**
GRADE LEVEL EXPECTATION / STRAND		**Waves and Electromagnetic Radiation**
GOAL	HS-PS4-2.	Evaluate questions about the advantages and disadvantages of using digital transmission and storage of information with respect to that of forms other than digital, including analog.
PERFORMANCE / CONTENT STANDARD		**HIGH SCHOOL LIFE SCIENCES**
GRADE LEVEL EXPECTATION / STRAND		**Interdependent Relationships in Ecosystems**
GOAL	HS-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
PERFORMANCE / CONTENT STANDARD		**HIGH SCHOOL EARTH AND SPACE SCIENCES**
GRADE LEVEL EXPECTATION / STRAND		**Weather and Climate**
GOAL	HS-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
PERFORMANCE / CONTENT STANDARD		**HIGH SCHOOL EARTH AND SPACE SCIENCES**
GRADE LEVEL EXPECTATION / STRAND		**Human Sustainability**
GOAL	HS-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
GOAL	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

GOAL	HS-ESS3-3.	Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.
GOAL	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
GOAL	HS-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
PERFORMANCE / CONTENT STANDARD		**HIGH SCHOOL EARTH AND SPACE SCIENCES**
GRADE LEVEL EXPECTATION / STRAND		**Engineering Design**
GOAL	HS-ETS1-1.	Analyze major global challenges to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
GOAL	HS-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
GOAL	HS-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Alaska Content and Performance Standards

Technology Education

Grade **11** - Adopted: **2019**

PERFORMANCE / CONTENT STANDARD		**Alaska Computer Science Standards**
GRADE LEVEL EXPECTATION / STRAND		**Entry Level Employment Competence**
GOAL		**Algorithms and Programming**
INDICATOR		**Algorithms**
INDICATOR	L1.AP.A.01.	Use algorithms (e.g., sequencing, selection, iteration, recursion, etc.) to create a prototype to provide a possible solution for a common problem.
PERFORMANCE / CONTENT STANDARD		**Alaska Computer Science Standards**
GRADE LEVEL EXPECTATION / STRAND		**Entry Level Employment Competence**
GOAL		**Algorithms and Programming**
INDICATOR		**Control**
INDICATOR	L1.AP.C.02.	Develop an event‐based program that will solve a practical problem, or allow self‐expression.

PERFORMANCE / CONTENT STANDARD		Alaska Computer Science Standards
GRADE LEVEL EXPECTATION / STRAND		Post-Secondary Education
GOAL		Algorithms and Programming
INDICATOR		Algorithms
INDICATOR	L2.AP.A.02.	Develop an artificial intelligence algorithm to play a game against a human opponent or solve a common problem.

PERFORMANCE / CONTENT STANDARD		Alaska Computer Science Standards
GRADE LEVEL EXPECTATION / STRAND		Post-Secondary Education
GOAL		Algorithms and Programming
INDICATOR		Program Development
INDICATOR	L2.AP.PD.02.	Using the software life cycle process, create software that will provide solutions for a variety of users.

PERFORMANCE / CONTENT STANDARD		Alaska Digital Literacy Standards
GRADE LEVEL EXPECTATION / STRAND		Innovative Design
GOAL	6-12.ID.1.	Students engage in a design process and employ it to generate ideas, create innovative products or solve authentic problems.
GOAL	6-12.ID.3.	Students engage in a design process to develop, test and revise prototypes, embracing the cyclical process of trial and error and understanding problems or setbacks as potential opportunities for improvement.
GOAL	6-12.ID.4.	Students demonstrate an ability to persevere and handle greater ambiguity as they work to solve open-ended problems.

PERFORMANCE / CONTENT STANDARD		Alaska Digital Literacy Standards
GRADE LEVEL EXPECTATION / STRAND		Computational Thinking
GOAL	6-12.CT.1.	Students practice defining problems to solve by computing for data analysis, modeling or algorithmic thinking.
GOAL	6-12.CT.3.	Students break problems into component parts, identify key pieces and use that information to problem solve.

GOAL	6-12.CT.4.	Students demonstrate an understanding of how automation works and use algorithmic thinking to design and automate solutions.

Arizona's College and Career Ready Standards

Mathematics

Grade **11** - Adopted: **2018**

STRAND		Standards for Mathematical Practice
CONCEPT / STANDARD	MP.1	Make sense of problems and persevere in solving them.
CONCEPT / STANDARD	MP.2	Reason abstractly and quantitatively.
CONCEPT / STANDARD	MP.3	Construct viable arguments and critique the reasoning of others.
CONCEPT / STANDARD	MP.4	Model with mathematics.
CONCEPT / STANDARD	MP.8	Look for and express regularity in repeated reasoning.

STRAND		Algebra 1
CONCEPT / STANDARD	**A1.A-CED**	**Algebra – Creating Equations (A-CED)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**A1.A-CED.A**	**Create equations that describe numbers or relationships.**
OBJECTIVE / GRADE LEVEL EXPECTATION	A1.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

STRAND		Algebra 1
CONCEPT / STANDARD	**A1.A-REI**	**Algebra – Reasoning with Equations and Inequalities (A-REI)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**A1.A-REI.A**	**Understand solving equations as a process of reasoning and explain the reasoning.**
OBJECTIVE / GRADE LEVEL EXPECTATION	A1.A-REI.A.1	Explain each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

STRAND		Algebra 1
CONCEPT / STANDARD	**A1.F-IF**	**Functions – Interpreting Functions (F-IF)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**A1.F-IF.C**	**Analyze functions using different representations.**

OBJECTIVE / GRADE LEVEL EXPECTATION	A1.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, exponential, quadratic, and piecewise-defined functions (limited to the aforementioned functions).

STRAND		**Algebra 1**
CONCEPT / STANDARD	**A1.F-LE**	**Functions – Linear, Quadratic, and Exponential Models (F-LE)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**A1.F-LE.A**	**Construct and compare linear, quadratic, and exponential models and solve problems.**
OBJECTIVE / GRADE LEVEL EXPECTATION	**A1.F-LE.A.1**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
GRADE LEVEL EXPECTATION	A1.F-LE.A.1.a.	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

STRAND		**Algebra 2**
CONCEPT / STANDARD	**A2.A-REI**	**Algebra – Reasoning with Equations and Inequalities (A-REI)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**A2.A-REI.A**	**Understand solving equations as a process of reasoning and explain the reasoning.**
OBJECTIVE / GRADE LEVEL EXPECTATION	A2.A-REI.A.1	Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.

STRAND		**Algebra 2**
CONCEPT / STANDARD	**A2.F-IF**	**Functions – Interpreting Functions (F-IF)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**A2.F-IF.C**	**Analyze functions using different representations.**
OBJECTIVE / GRADE LEVEL EXPECTATION	A2.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Extend from linear, quadratic and exponential functions to include square root, cube root, polynomial, exponential, logarithmic, sine, cosine, tangent and piecewise-defined functions.

STRAND		**Geometry**
CONCEPT / STANDARD	**G.G-GPE**	**Geometry – Expressing Geometric Properties with Equations (G-GPE)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**G.G-GPE.B**	**Use coordinates to prove geometric theorems algebraically.**
OBJECTIVE / GRADE LEVEL EXPECTATION	G.G-GPE.B.5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems, including finding the equation of a line parallel or perpendicular to a given line that passes through a given point.

STRAND		**Precalculus**

CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.1	Make sense of problems and persevere in solving them.

OBJECTIVE / GRADE LEVEL EXPECTATION

Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, “Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.2	Reason abstractly and quantitatively.

OBJECTIVE / GRADE LEVEL EXPECTATION

Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.3	Construct viable arguments and critique the reasoning of others.

OBJECTIVE / GRADE LEVEL EXPECTATION

Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.

STRAND		Precalculus
CONCEPT / STANDARD	PC.MP	Standards for Mathematical Practice
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	PC.MP.4	Model with mathematics.

OBJECTIVE / GRADE LEVEL EXPECTATION	Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

STRAND		**Precalculus**
CONCEPT / STANDARD	**PC.MP**	**Standards for Mathematical Practice**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**PC.MP.8**	**Look for and express regularity in repeated reasoning.**

OBJECTIVE / GRADE LEVEL EXPECTATION	Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.

STRAND		**Quantitative Reasoning**
CONCEPT / STANDARD	**QR.MP**	**Standards for Mathematical Practice (MP)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**QR.MP.1**	**Make sense of problems and persevere in solving them.**

OBJECTIVE / GRADE LEVEL EXPECTATION	Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, “Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.

STRAND		**Quantitative Reasoning**
CONCEPT / STANDARD	**QR.MP**	**Standards for Mathematical Practice (MP)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**QR.MP.2**	**Reason abstractly and quantitatively.**

OBJECTIVE / GRADE LEVEL EXPECTATION	Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.

STRAND		**Quantitative Reasoning**
CONCEPT / STANDARD	**QR.MP**	**Standards for Mathematical Practice (MP)**

PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**QR.MP.3**	**Construct viable arguments and critique the reasoning of others.**
OBJECTIVE / GRADE LEVEL EXPECTATION		Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.
STRAND		**Quantitative Reasoning**
CONCEPT / STANDARD	**QR.MP**	**Standards for Mathematical Practice (MP)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**QR.MP.4**	**Model with mathematics.**
OBJECTIVE / GRADE LEVEL EXPECTATION		Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
STRAND		**Quantitative Reasoning**
CONCEPT / STANDARD	**QR.MP**	**Standards for Mathematical Practice (MP)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**QR.MP.8**	**Look for and express regularity in repeated reasoning.**
OBJECTIVE / GRADE LEVEL EXPECTATION		Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.

Arizona's College and Career Ready Standards

Science

Grade **11** - Adopted: **2018**

STRAND		**Core Ideas for Knowing Science**
CONCEPT / STANDARD		**Earth and Space Science**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	E1:	The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.
STRAND		**Core Ideas for Using Science**

CONCEPT / STANDARD	U2:	The knowledge produced by science is used in engineering and technologies to solve problems and/or create products.

STRAND		**High School Physical Sciences**
CONCEPT / STANDARD		**Chemistry – P1: All matter in the Universe is made of very small particles.**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		**Nuclear Processes and Applications of Chemistry**
OBJECTIVE / GRADE LEVEL EXPECTATION	HS.P1U3.4.	Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

STRAND		**High School Earth and Space Sciences**
CONCEPT / STANDARD		**Earth and Space – E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		**Weather & Climate**
OBJECTIVE / GRADE LEVEL EXPECTATION	HS+E.E1 U1.2.	Develop and use models to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

STRAND		**High School Earth and Space Sciences**
CONCEPT / STANDARD		**Earth and Space – E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		**Roles of Water in Earth's Surface Processes**
OBJECTIVE / GRADE LEVEL EXPECTATION	HS.E1U1.12.	Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

STRAND		**High School Earth and Space Sciences**
CONCEPT / STANDARD		**Earth and Space – E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		**Earth and Human Activity**
OBJECTIVE / GRADE LEVEL EXPECTATION	HS.E1U3.14.	Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.
OBJECTIVE / GRADE LEVEL EXPECTATION	HS+E.E1 U3.9.	Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

OBJECTIVE / GRADE LEVEL EXPECTATION	HS+E.E1 U3.11.	Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

STRAND		**High School Life Sciences**
CONCEPT / STANDARD		**Life Science – L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms & L4: The unity and diversity of organisms, living and extinct, is the result of evolution.**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		**Ecosystems**
OBJECTIVE / GRADE LEVEL EXPECTATION	HS.L2U3.18.	Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

Arizona's College and Career Ready Standards

Technology Education

Grade **11** - Adopted: **2022**

STRAND		**Arizona Educational Technology Standards 2022**
CONCEPT / STANDARD	**Standard 4.**	**Innovative Designer - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	9-12.4.a.	Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	9-12.4.b.	Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

STRAND		**Arizona Educational Technology Standards 2022**
CONCEPT / STANDARD	**Standard 5.**	**Computational Thinker - Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	9-12.5.a.	Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	9-12.5.b.	Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	9-12.5.c.	Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.

Grade **11** - Adopted: **2018**

STRAND		**Computer Science**

CONCEPT / STANDARD		**Practices**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**Practice 3.**	**Recognizing and Defining Computational Problems: The ability to recognize appropriate and worthwhile opportunities to apply computation is a skill that develops over time and is central to computing. Solving a problem with a computational approach requires defining the problem, breaking it down into parts, and evaluating each part to determine whether a computational solution is appropriate.**
OBJECTIVE / GRADE LEVEL EXPECTATION	3.1.	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
OBJECTIVE / GRADE LEVEL EXPECTATION	3.2.	Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures.
STRAND		**Computer Science**
CONCEPT / STANDARD		**Practices**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**Practice 5.**	**Creating Computational Artifacts: The process of developing computational artifacts embraces both creative expression and the exploration of ideas to create prototypes and solve computational problems. Students create artifacts that are personally relevant or beneficial to their community and beyond. Computational artifacts can be created by combining and modifying existing artifacts or by developing new artifacts. Examples of computational artifacts include programs, simulations, visualizations, digital animations, robotic systems, and apps.**
OBJECTIVE / GRADE LEVEL EXPECTATION	5.2.	Create a computational artifact for practical intent, personal expression, or to address a societal issue.
STRAND		**Computer Science**
CONCEPT / STANDARD		**Practices**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL	**Practice 6.**	**Testing and Refining Computational Artifacts: Testing and refinement is the deliberate and iterative process of improving a computational artifact. This process includes debugging (identifying and fixing errors) and comparing actual outcomes to intended outcomes. Students also respond to the changing needs and expectations of end users and improve the performance, reliability, usability, and accessibility of artifacts.**
OBJECTIVE / GRADE LEVEL EXPECTATION	6.1.	Systematically test computational artifacts by considering all scenarios and using test cases.
OBJECTIVE / GRADE LEVEL EXPECTATION	6.3.	Evaluate and refine a computational artifact multiple times to enhance its performance, reliability, usability, and accessibility.
STRAND		**Computer Science**
CONCEPT / STANDARD		**Concept: Algorithms and Programming (AP)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		**Subconcept: Algorithms (A)**
OBJECTIVE / GRADE LEVEL EXPECTATION	HS.AP.A.1.	Create prototypes that use algorithms for practical intent, personal expression, or to address a societal issue. Practice(s): Creating Computational Artifacts: 5.2

STRAND		**Computer Science**
CONCEPT / STANDARD		**Concept: Impacts of Computing (IC)**
PERFORMANCE OBJECTIVE / PROFICIENCY LEVEL		**Subconcept: Culture (C)**
OBJECTIVE / GRADE LEVEL EXPECTATION	HS.IC.C.3.	Demonstrate ways a given algorithm applies to problems across disciplines. Practice(s): Recognizing and Defining Computational Problems: 3.1

Arkansas Standards

Mathematics

Grade **11** - Adopted: **2023**

STRAND / TOPIC		**Algebra I Mathematics Standards**
CONTENT STANDARD	**A1.LFE.**	**Linear Functions, Equations, & Inequalities**
PERFORMANCE EXPECTATION		**Graphing & Transformations - Students graph linear functions, equations, and inequalities.**
BENCHMARK / PROFICIENCY	A1.LFE.15.	Write linear equations that model the relationship between two quantities and produce a graph of the equation.
BENCHMARK / PROFICIENCY	A1.LFE.16.	Graph linear functions expressed as an equation and show intercepts of the graph without technology.

Grade **11** - Adopted: **2016**

STRAND / TOPIC		**Algebra I Part A**
CONTENT STANDARD		**Creating Equations**
PERFORMANCE EXPECTATION		**Create equations that describe numbers or relationships**
BENCHMARK / PROFICIENCY	HSA.CED.A.2	Create equations in two or more variables to represent relationships between quantities. Graph equations, in two variables, on a coordinate plane.

STRAND / TOPIC		**Algebra I Part A**
CONTENT STANDARD		**Reasoning with Equations and Inequalities**
PERFORMANCE EXPECTATION		**Understand solving equations as a process of reasoning and explain the reasoning**
BENCHMARK / PROFICIENCY	HSA.REI.A.1	Assuming that equations have a solution, construct a solution and justify the reasoning used.

STRAND / TOPIC		**Algebra I Part A**
CONTENT STANDARD		**Interpreting Functions**

PERFORMANCE EXPECTATION		**Analyze functions using different representations**
BENCHMARK / PROFICIENCY	**HSF.IF.C.7**	**Graph functions expressed algebraically and show key features of the graph, with and without technology.**
DESCRIPTOR		Graph linear and quadratic functions and, when applicable, show intercepts, maxima, and minima.

STRAND / TOPIC		**Algebra I Part A**
CONTENT STANDARD		**Linear, Quadratic, and Exponential Models**
PERFORMANCE EXPECTATION		**Construct and compare linear, quadratic, and exponential models and solve problems**
BENCHMARK / PROFICIENCY	**HSF.LE.A.1**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
DESCRIPTOR		Show that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

STRAND / TOPIC		**Algebra I Part B**
CONTENT STANDARD		**Creating Equations**
PERFORMANCE EXPECTATION		**Create equations that describe numbers or relationships**
BENCHMARK / PROFICIENCY	HSA.CED.A.2	Create equations in two or more variables to represent relationships between quantities. Graph equations, in two variables, on a coordinate plane.

STRAND / TOPIC		**Algebra I Part B**
CONTENT STANDARD		**Reasoning with Equations and Inequalities**
PERFORMANCE EXPECTATION		**Understand solving equations as a process of reasoning and explain the reasoning**
BENCHMARK / PROFICIENCY	HSA.REI.A.1	Assuming that equations have a solution, construct a solution and justify the reasoning used.

STRAND / TOPIC		**Algebra I Part B**
CONTENT STANDARD		**Interpreting Functions**
PERFORMANCE EXPECTATION		**Analyze functions using different representations**
BENCHMARK / PROFICIENCY	**HSF.IF.C.7**	**Graph functions expressed algebraically and show key features of the graph, with and without technology.**
DESCRIPTOR		Graph linear and quadratic functions and, when applicable, show intercepts, maxima, and minima.

STRAND / TOPIC		**Algebra I Part B**
CONTENT STANDARD		**Linear, Quadratic, and Exponential Models**
PERFORMANCE EXPECTATION		**Construct and compare linear, quadratic, and exponential models and solve problems**
BENCHMARK / PROFICIENCY	**HSF.LE.A.1**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
DESCRIPTOR		Show that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

STRAND / TOPIC		**Algebra II**
CONTENT STANDARD		**Creating Equations**
PERFORMANCE EXPECTATION		**Create equations that describe numbers or relationships**
BENCHMARK / PROFICIENCY	HSA.CED.A.2	Create equations in two or more variables to represent relationships between quantities. Graph equations, in two variables, on a coordinate plane.

STRAND / TOPIC		**Algebra II**
CONTENT STANDARD		**Reasoning with Equations and Inequalities**
PERFORMANCE EXPECTATION		**Understand solving equations as a process of reasoning and explain the reasoning**
BENCHMARK / PROFICIENCY	HSA.REI.A.1	Assuming that equations have a solution, construct a solution and justify the reasoning used.

STRAND / TOPIC		**Bridge to Algebra II**
CONTENT STANDARD		**Representing Functions**
PERFORMANCE EXPECTATION		**Represent and solve equations and inequalities graphically and analyze functions using different representations.**
BENCHMARK / PROFICIENCY	**RF.2.BTAII.2**	**Graph functions expressed algebraically and show key features of the graph, with and without technology.**
DESCRIPTOR		Graph linear and quadratic functions and, when applicable, show intercepts, maxima, and minima.

STRAND / TOPIC		**Bridge to Algebra II**
CONTENT STANDARD		**Function Modeling**
PERFORMANCE EXPECTATION		**Create equations that describe numbers or relationships, interpret functions that arise in applications in terms of a context, analyze functions using different representations, build a function that models a relationship between two quantities, and build new functions from existing functions.**

BENCHMARK / PROFICIENCY	FM.3.BTA II.2	Create equations in two or more variables to represent relationships between quantities. Graph equations, in two variables, on a coordinate plane.

Grade **11** - Adopted: **2023**

STRAND / TOPIC		**Geometry Mathematics Standards**
CONTENT STANDARD	**G.LA.**	**Lines & Angles**
PERFORMANCE EXPECTATION		**Parallel & Perpendicular Lines - Students solve problems involving parallel and perpendicular lines.**
BENCHMARK / PROFICIENCY	G.LA.6.	Write an equation of a line that is parallel or perpendicular to a given line and passing through a given point.

Grade **11** - Adopted: **2016**

STRAND / TOPIC		**Mathematical Applications and Algorithms**
CONTENT STANDARD		**Functions**
PERFORMANCE EXPECTATION		**The student will graphically, numerically, and algebraically evaluate concepts of different types of functions; include recursively defined functions, series, and sequences; and apply them to programming applications.**
BENCHMARK / PROFICIENCY	**F.1.MAA.2**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases:**
DESCRIPTOR		Graph linear and quadratic functions and show intercepts, maxima, and minima
STRAND / TOPIC		**Pre-Calculus**
CONTENT STANDARD		**Functions**
PERFORMANCE EXPECTATION		**Students will be able to interpret different types of functions and their key characteristics including polynomial, exponential, logarithmic, power, trigonometric, rational, and other types of functions.**
BENCHMARK / PROFICIENCY	**F.7.PC.6**	**Graph functions expressed algebraically and show key features of the graph, with and without technology.**
DESCRIPTOR		Graph linear and quadratic functions and, when applicable, show intercepts, maxima, and minima.

Grade **11** - Adopted: **2017**

STRAND / TOPIC		**Quantitative Literacy**
CONTENT STANDARD		**Modeling**
PERFORMANCE EXPECTATION		**Students will use appropriate mathematical models to solve problems.**
BENCHMARK / PROFICIENCY	M.1.QL.2	Analyze mathematical models, describe limitations, and suggest improvements

Grade **11** - Adopted: **2019**

STRAND / TOPIC		**Technical Math for College and Career**

CONTENT STANDARD		**Mathematical Processes and Models**
PERFORMANCE EXPECTATION	**MPM.2.**	**Students will use mathematical processes and models to acquire, demonstrate, and communicate mathematical understanding in real-world scenarios.**
BENCHMARK / PROFICIENCY	**MPM.2.TM.3**	**Create mathematical models and use problem-solving skills, independently and as a collaborative team, for real-world scenarios to**
DESCRIPTOR		formulate a plan or strategy
DESCRIPTOR		describe limitations
DESCRIPTOR		identify how results are affected by changing parameters(e.g., cost of materials, cost of labor, work time required to improve the overall cost of a project)
DESCRIPTOR		suggest improvements
STRAND / TOPIC		**Technical Math for College and Career**
CONTENT STANDARD		**Mathematical Processes and Models**
PERFORMANCE EXPECTATION	**MPM.2.**	**Students will use mathematical processes and models to acquire, demonstrate, and communicate mathematical understanding in real-world scenarios.**
BENCHMARK / PROFICIENCY	MPM.2.TM.5	Demonstrate effective use of resources (e.g., faculty, other students, reference materials, industry resources, the internet)

Arkansas Standards

Science

Grade **11** - Adopted: **2016**

STRAND / TOPIC	**AR.BI.**	**Biology – Integrated**
CONTENT STANDARD		**Biodiversity and Population Dynamics**
PERFORMANCE EXPECTATION	BI-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
PERFORMANCE EXPECTATION	BI3-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
STRAND / TOPIC	**AR.BI.**	**Biology – Integrated**
CONTENT STANDARD		**Life and Earth's Systems**
PERFORMANCE EXPECTATION	BI-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

PERFORMANCE EXPECTATION	BI-ESS3-5.	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
PERFORMANCE EXPECTATION	BI6-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
PERFORMANCE EXPECTATION	BI6-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
STRAND / TOPIC	**AR.BI.**	**Biology – Integrated**
CONTENT STANDARD		**Human Impacts on Earth's Systems**
PERFORMANCE EXPECTATION	BI-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
PERFORMANCE EXPECTATION	BI-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
PERFORMANCE EXPECTATION	BI-ESS3-3.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
PERFORMANCE EXPECTATION	BI-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
PERFORMANCE EXPECTATION	BI-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
PERFORMANCE EXPECTATION	BI7-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
PERFORMANCE EXPECTATION	BI7-ETS1-4.	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
STRAND / TOPIC	**AR.CI.**	**Chemistry – Integrated**
CONTENT STANDARD		**Nuclear Reactions**
PERFORMANCE EXPECTATION	CI2-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

STRAND / TOPIC	**AR.CI.**	**Chemistry – Integrated**
CONTENT STANDARD		**Energy Flow**
PERFORMANCE EXPECTATION	CI-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
PERFORMANCE EXPECTATION	CI-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
STRAND / TOPIC	**AR.CII.**	**Chemistry II**
CONTENT STANDARD		**Reactions**
PERFORMANCE EXPECTATION	CII-PS3-3AR.	Plan and carry out an investigation to predict the outcome of a chemical reaction based on patterns of chemical properties.
PERFORMANCE EXPECTATION	CII3-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
STRAND / TOPIC	**AR.CII.**	**Chemistry II**
CONTENT STANDARD		**Thermochemistry**
PERFORMANCE EXPECTATION	CII-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
STRAND / TOPIC	**AR.ES.**	**Earth Science**
CONTENT STANDARD		**Earth's Systems**
PERFORMANCE EXPECTATION	ES2-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
PERFORMANCE EXPECTATION	ES2-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
STRAND / TOPIC	**AR.ES.**	**Earth Science**
CONTENT STANDARD		**Human Sustainability**

PERFORMANCE EXPECTATION	ES-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
PERFORMANCE EXPECTATION	ES-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
PERFORMANCE EXPECTATION	ES-ESS3-3.	Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.
PERFORMANCE EXPECTATION	ES-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
PERFORMANCE EXPECTATION	ES-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
PERFORMANCE EXPECTATION	ES3-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
PERFORMANCE EXPECTATION	ES3-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
PERFORMANCE EXPECTATION	ES3-ETS1-4.	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
STRAND / TOPIC	**AR.ES.**	**Earth Science**
CONTENT STANDARD		**Weather and Climate**
PERFORMANCE EXPECTATION	ES-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
PERFORMANCE EXPECTATION	ES4-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
STRAND / TOPIC	**AR.EVS.**	**Environmental Science**
CONTENT STANDARD		**Systems**
PERFORMANCE EXPECTATION	EVS-ESS3-5.	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

PERFORMANCE EXPECTATION	EVS1-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
STRAND / TOPIC	**AR.EVS.**	**Environmental Science**
CONTENT STANDARD		**Energy**
PERFORMANCE EXPECTATION	EVS-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
PERFORMANCE EXPECTATION	EVS-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
STRAND / TOPIC	**AR.EVS.**	**Environmental Science**
CONTENT STANDARD		**Sustainability**
PERFORMANCE EXPECTATION	EVS-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrences of natural hazards, and changes in climate have influenced human activity.
PERFORMANCE EXPECTATION	EVS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
PERFORMANCE EXPECTATION	EVS-ESS3-3.	Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.
PERFORMANCE EXPECTATION	EVS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
PERFORMANCE EXPECTATION	EVS-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
PERFORMANCE EXPECTATION	EVS-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity
PERFORMANCE EXPECTATION	EVS4-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
STRAND / TOPIC	**AR.PSI.**	**Physical Science – Integrated**
CONTENT STANDARD		**Elements, Matter, and Interactions**

PERFORMANCE EXPECTATION	PSI-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
STRAND / TOPIC	**AR.PSI.**	**Physical Science – Integrated**
CONTENT STANDARD		**Matter in Organisms**
PERFORMANCE EXPECTATION	PSI2-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
STRAND / TOPIC	**AR.PSI.**	**Physical Science – Integrated**
CONTENT STANDARD		**Forces and Motion**
PERFORMANCE EXPECTATION	PSI3-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
STRAND / TOPIC	**AR.PSI.**	**Physical Science – Integrated**
CONTENT STANDARD		**Energy**
PERFORMANCE EXPECTATION	PSI-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
PERFORMANCE EXPECTATION	PSI4-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
STRAND / TOPIC	**AR.PSI.**	**Physical Science – Integrated**
CONTENT STANDARD		**Waves**
PERFORMANCE EXPECTATION	PSI-PS4-2.	Evaluate questions about the advantages of using a digital transmission and storage of information.
PERFORMANCE EXPECTATION	PSI-5-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
STRAND / TOPIC	**AR.PSI.**	**Physical Science – Integrated**
CONTENT STANDARD		**Interactions of Humans and the Environment**

PERFORMANCE EXPECTATION	PSI-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
PERFORMANCE EXPECTATION	PSI-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
PERFORMANCE EXPECTATION	PSI-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
PERFORMANCE EXPECTATION	PSI6-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
PERFORMANCE EXPECTATION	PSI6-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
PERFORMANCE EXPECTATION	PSI6-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
PERFORMANCE EXPECTATION	PSI6-ETS1-4.	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
STRAND / TOPIC	**AR.P.**	**Physics**
CONTENT STANDARD		**Motion**
PERFORMANCE EXPECTATION	P1-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
STRAND / TOPIC	**AR.P.**	**Physics**
CONTENT STANDARD		**Work and Energy**
PERFORMANCE EXPECTATION	P2-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
STRAND / TOPIC	**AR.P.**	**Physics**
CONTENT STANDARD		**Heat and Thermodynamics**
PERFORMANCE EXPECTATION	P-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

PERFORMANCE EXPECTATION	P3-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
PERFORMANCE EXPECTATION	P3-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
PERFORMANCE EXPECTATION	P3-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
PERFORMANCE EXPECTATION	P3-ETS1-4.	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
STRAND / TOPIC	**AR.P.**	**Physics**
CONTENT STANDARD		**Electricity**
PERFORMANCE EXPECTATION	P5-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Grade **11** - Adopted: **2010**

STRAND / TOPIC	**AR.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
CONTENT STANDARD		**Key Ideas and Details**
PERFORMANCE EXPECTATION	RST.11-12.2.	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
PERFORMANCE EXPECTATION	RST.11-12.3.	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
STRAND / TOPIC	**AR.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
CONTENT STANDARD		**Craft and Structure**
PERFORMANCE EXPECTATION	RST.11-12.4.	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
PERFORMANCE EXPECTATION	RST.11-12.5.	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
PERFORMANCE EXPECTATION	RST.11-12.6.	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

STRAND / TOPIC	**AR.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
CONTENT STANDARD		**Integration of Knowledge and Ideas**
PERFORMANCE EXPECTATION	RST.11-12.9.	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

STRAND / TOPIC	**AR.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
CONTENT STANDARD		**Range of Reading and Level of Text Complexity**
PERFORMANCE EXPECTATION	RST.11-12.10.	By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

STRAND / TOPIC	**AR.WHST.11-12.**	**Writing Standards for Literacy in Science and Technical Subjects**
CONTENT STANDARD		**Text Types and Purposes**
PERFORMANCE EXPECTATION	**WHST.11-12.2.**	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**
BENCHMARK / PROFICIENCY	WHST.11-12.2(d)	Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

STRAND / TOPIC	**AR.WHST.11-12.**	**Writing Standards for Literacy in Science and Technical Subjects**
CONTENT STANDARD		**Production and Distribution of Writing**
PERFORMANCE EXPECTATION	WHST.11-12.4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
PERFORMANCE EXPECTATION	WHST.11-12.6.	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Arkansas Standards

Technology Education

Grade **11** - Adopted: **2020/Beginning 2021**

STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 1**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**

BENCHMARK / PROFICIENCY	AIML.Y1. 1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	AIML.Y1. 1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	AIML.Y1. 1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	AIML.Y1. 5.1.	Design and implement level-appropriate algorithms that use iteration, selection, and sequence
BENCHMARK / PROFICIENCY	AIML.Y1. 5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms
BENCHMARK / PROFICIENCY	AIML.Y1. 5.4.	Use a systematic approach to detect and resolve errors in a given algorithm
STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	AIML.Y1. 6.1.	Create programs using procedures to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	AIML.Y1. 6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	AIML.Y2. 1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	AIML Y2:	Include solving problems by backtracking, pattern recognition, and searching through classic searches including, but not limited to, heuristic search strategies

BENCHMARK / PROFICIENCY	AIML.Y2.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	AIML Y2:	Include representations of backtracking of constraint satisfaction problems, decision trees with and without operator costs, and game-based adversarial searches
BENCHMARK / PROFICIENCY	AIML.Y2.1.5.	Decompose problems, including constraint satisfaction problems, of level-appropriate complexity
BENCHMARK / PROFICIENCY	AIML.Y2.1.6.	Analyze and utilize decision theory techniques (e.g., adversarial searches, decision networks, game theory, influence diagrams, Markov decision processes, probability theory, satisficing, utility theory) to represent and solve problems of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	AIML.Y2.5.1.	Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence
BENCHMARK / PROFICIENCY	AIML.Y2.5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms including classic search and sort algorithms
BENCHMARK / PROFICIENCY	AIML.Y2.5.5.	Identify and utilize the metrics for measuring artificial intelligence and machine learning algorithms
STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	AIML Y2:	Programs must also utilize supervised learning algorithms, unsupervised learning algorithms, or reinforcement learning algorithms at an appropriate level
BENCHMARK / PROFICIENCY	AIML.Y2.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 2**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 7: Students will analyze the utilization of computers within industry.**
BENCHMARK / PROFICIENCY	AIML.Y2.7.1.	Utilize hardware and/or software to solve level-appropriate industry-based problems

STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 3**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	AIML.Y3.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity, including but not limited to, utilizing advanced pattern recognition strategies; advanced search techniques (e.g., continuous space searches, nondeterministic actions, partial observations); backtracking; and searches within complex environments and online environments
BENCHMARK / PROFICIENCY	AIML.Y3.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity including, but not limited to, backtracking of constraint satisfaction problems and game-based adversarial searches
BENCHMARK / PROFICIENCY	AIML.Y3.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
BENCHMARK / PROFICIENCY	AIML.Y3.1.5.	Decompose problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	AIML.Y3.1.6.	Utilize decision theory techniques (e.g., adversarial searches, decision networks, game theory, influence diagrams, information value theory, Markov decision processes, multi-attribute utility theory, noncooperative game theory, probability theory, satisficing, utility theory) to represent and solve problems of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 3**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	AIML.Y3.5.1.	Design and implement level-appropriate algorithms that use appropriate techniques (e.g., dynamic programming, linear programming, policy iteration, value iteration) to solve Markov decision process problems and other complex decisions
STRAND / TOPIC		**Computer Science: Artificial Intelligence and Machine Learning – Year 3**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	AIML.Y3.6.1.	Create level-appropriate programs that utilize supervised learning algorithms, unsupervised learning algorithms, and reinforcement learning algorithms to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	AIML.Y3.6.2.	Apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Computer Engineering – Year 1**

CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSCE.Y1.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSCE.Y1.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSCE.Y1.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Computer Engineering – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSCE.Y1.5.1.	Design and implement level-appropriate algorithms that use iteration, selection, and sequence
STRAND / TOPIC		**Computer Science: Computer Engineering – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSCE.Y1.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Computer Engineering – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSCE.Y2.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSCE.Y2.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSCE.Y2.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Computer Engineering – Year 2**

CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 2: Students will analyze and utilize connections between concepts of mathematics and computer science.**
BENCHMARK / PROFICIENCY	CSCE.Y2.2.9.	Solve problems of level-appropriate complexity using fundamental laws of electricity (e.g., Faraday, Kirchhoff, Ohms)

STRAND / TOPIC		**Computer Science: Computer Engineering – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSCE.Y2.5.1.	Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence
BENCHMARK / PROFICIENCY	CSCE Y2:	Include evaluation of scheduling algorithms on system performance; algorithms used in application domains including control applications; discrete event simulation applications; encryption/decryption algorithms; and location-aware or mobile applications

STRAND / TOPIC		**Computer Science: Computer Engineering – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSCE.Y2.6.1.	Create programs to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSCE.Y2.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
BENCHMARK / PROFICIENCY	CSCE.Y2.6.8.	Describe the sampling theorem and related concepts of the aliasing and Nyquist frequency

STRAND / TOPIC		**Computer Science: Computer Engineering – Year 2**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 9: Students will utilize appropriate hardware and software.**
BENCHMARK / PROFICIENCY	CSCE.Y2.9.10.	Define important engineering constraints such as cost, performance, power, size, timing, and weight and their tradeoffs in the context of digital systems design

STRAND / TOPIC		**Computer Science: Computer Engineering – Year 2**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSCE.Y2.10.9.	Create and maintain a digital collection of self-created work

STRAND / TOPIC		**Computer Science: Computer Engineering – Year 3**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSCE.Y3.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSCE.Y3.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSCE.Y3.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity

STRAND / TOPIC		**Computer Science: Computer Engineering – Year 3**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 2: Students will analyze and utilize connections between concepts of mathematics and computer science.**
BENCHMARK / PROFICIENCY	CSCE.Y3.2.9.	Solve problems of level-appropriate complexity using fundamental laws of electricity (e.g., Faraday, Kirchhoff, Ohms)

STRAND / TOPIC		**Computer Science: Computer Engineering – Year 3**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSCE.Y3.5.1.	Design and implement level-appropriate algorithms including, but not limited to, brute force, divide and conquer, and greedy algorithms
BENCHMARK / PROFICIENCY	CSCE.Y3.5.2.	Illustrate the flow of execution of algorithms in level-appropriate programs including high-impedance state and logic gate implementation including a tristate buffer

STRAND / TOPIC		**Computer Science: Computer Engineering – Year 3**

CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSCE.Y3.6.2.	Apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Computer Engineering – Year 3**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 9: Students will utilize appropriate hardware and software.**
BENCHMARK / PROFICIENCY	CSCE.Y3.9.11.	Create programs that use one or more external sensors for monitoring physical properties
STRAND / TOPIC		**Computer Science: Computer Engineering – Year 3**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSCE.Y3.10.9.	Create and maintain a professional digital portfolio comprised of self-created work
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 1**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSCS.Y1.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSCS.Y1.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSCS.Y1.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**

BENCHMARK / PROFICIENCY	CSCS.Y1 .5.1.	Design and implement level-appropriate algorithms that use iteration, selection, and sequence
BENCHMARK / PROFICIENCY	CSCS.Y1 .5.2.	Illustrate the flow of execution of algorithms in level-appropriate programs including branching and looping
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSCS.Y1 .6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSCS.Y2 .1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSCS Y2:	Extend problem-solving strategies to include an understanding of adversarial thinking
BENCHMARK / PROFICIENCY	CSCS.Y2 .1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSCS.Y2 .1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 2: Students will analyze and utilize connections between concepts of mathematics and computer science.**
BENCHMARK / PROFICIENCY	CSCS.Y2 .2.3.	Research and implement level-appropriate common cryptography algorithms and concepts such as random number generation and hashing functions
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**

PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSCS.Y2.5.1.	Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSCS.Y2.6.1.	Create programs to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSCS.Y2.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
BENCHMARK / PROFICIENCY	CSCS Y2:	Discuss the vulnerabilities of not applying best practices of program design, format, and distribution
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 2**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 7: Students will analyze the utilization of computers within industry.**
BENCHMARK / PROFICIENCY	CSCS.Y2.7.1.	Utilize hardware and/or software to solve level-appropriate industry-based problems
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 3**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSCS.Y3.1.1.	Leverage adversarial thinking and risk concepts to solve complex cybersecurity problems
STRAND / TOPIC		**Computer Science: Cybersecurity – Year 3**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSCS.Y3.5.1.	Design and implement algorithms that solve level-appropriate, student-identified problems

STRAND / TOPIC		**Computer Science: Cybersecurity – Year 3**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSCS.Y3.6.1.	Create programs to solve problems of level-appropriate complexity that obtain data from external sources

STRAND / TOPIC		**Computer Science: Cybersecurity – Year 3**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSCS.Y3.10.7.	Create and maintain a professional digital portfolio comprised of self-created work

STRAND / TOPIC		**Computer Science: Data Science – Year 1**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSDS.Y1.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSDS.Y1.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSDS.Y1.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity

STRAND / TOPIC		**Computer Science: Data Science – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSDS.Y1.5.1.	Design and implement level-appropriate algorithms that use iteration, selection, and sequence

STRAND / TOPIC		**Computer Science: Data Science – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**

PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSDS.Y1.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Data Science – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSDS.Y2.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSDS.Y2.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
STRAND / TOPIC		**Computer Science: Data Science – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSDS.Y2.5.1.	Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence
STRAND / TOPIC		**Computer Science: Data Science – Year 2**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSDS.Y2.10.10.	Create and maintain a digital collection of self-created work
STRAND / TOPIC		**Computer Science: Data Science – Year 3**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSDS.Y3.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Data Science – Year 3**

CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSDS.Y3.10.10.	Create and maintain a professional digital portfolio comprised of self-created work
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 1**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSGD.Y1.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSGD.Y1.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSGD.Y1.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSGD.Y1.5.1.	Design and implement level-appropriate algorithms that use iteration, selection, and sequence
BENCHMARK / PROFICIENCY	CSGD.Y1.5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSGD.Y1.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**

PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSGD.Y2.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSGD.Y2.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSGD.Y2.1.5.	Decompose problems of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 2: Students will analyze and utilize connections between concepts of mathematics and computer science.**
BENCHMARK / PROFICIENCY	CSGD.Y2.2.7.	Research physics and mathematical principles to adapt to more immersive game mechanics
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSGD.Y2.5.1.	Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence
BENCHMARK / PROFICIENCY	CSGD.Y2.5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms including classic search and sort algorithms
BENCHMARK / PROFICIENCY	CSGD.Y2.5.5.	Analyze game elements of analog games (e.g., board, card, dice) and how those elements can be represented as algorithms for digital games
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSGD.Y2.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 2**

CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 7: Students will analyze the utilization of computers within industry.**
BENCHMARK / PROFICIENCY	CSGD.Y2.7.1.	Utilize hardware and/or software to solve level-appropriate industry-based problems
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 2**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSGD.Y2.10.10.	Create and maintain a digital collection of self-created work
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 3—Advanced**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSGD.Y3.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSGD.Y3.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSGD.Y3.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSGD.Y3.1.5.	Decompose problems of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 3—Advanced**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 2: Students will analyze and utilize connections between concepts of mathematics and computer science.**
BENCHMARK / PROFICIENCY	CSGD.Y3.2.7.	Research and utilize physics and mathematical principles to adapt to more immersive game mechanics
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 3—Advanced**
CONTENT STANDARD		**Strand: Algorithms and Programs**

PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSGD.Y3.5.1.	Design and implement algorithms to solve student-identified problems of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 3—Advanced**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 9: Students will utilize appropriate hardware and software.**
BENCHMARK / PROFICIENCY	CSGD.Y3.9.2.	Contribute to team collaboration in the development of a computational artifact (e.g, creating and managing repositories)
STRAND / TOPIC		**Computer Science: Game Development and Design – Year 3—Advanced**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSGD.Y3.10.10.	Create and maintain a professional digital portfolio comprised of self-created work
BENCHMARK / PROFICIENCY	CSGD.Y3.10.11.	Utilize and model effective professional project management tools
STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 1**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSMD.Y1.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSMD.Y1.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSMD.Y1.5.1.	Design and implement level-appropriate algorithms that use iteration, selection, and sequence

STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSMD.Y 1.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)

STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSMD.Y 2.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSMD.Y 2.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity

STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSMD.Y 2.5.1.	Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence
BENCHMARK / PROFICIENCY	CSMD.Y 2.5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms including classic search and sort algorithms

STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSMD.Y 2.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)

STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 2**
CONTENT STANDARD		**Strand: Computers and Communications**

PERFORMANCE EXPECTATION		**Content Cluster 7: Students will analyze the utilization of computers within industry.**
BENCHMARK / PROFICIENCY	CSMD.Y 2.7.1.	Utilize hardware and/or software to solve level-appropriate industry-based problems
STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 2**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 9: Students will utilize appropriate hardware and software.**
BENCHMARK / PROFICIENCY	CSMD.Y 2.9.5.	Discuss mobile device limitations (e.g., memory, processing power, screen resolution) that affect mobile application development
STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 2**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSMD.Y 2.10.9.	Create and maintain a digital collection of self-created work
STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 3—Advanced**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSMD.Y 3.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSMD.Y 3.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 3—Advanced**
CONTENT STANDARD		**Strand: Data, Information, and Security**
PERFORMANCE EXPECTATION		**Content Cluster 3: Students will analyze and utilize data through the use of computing devices.**
BENCHMARK / PROFICIENCY	CSMD.Y 3.3.3.	Create and evaluate models and simulations to answer student-identified questions and scenarios
BENCHMARK / PROFICIENCY	CSMD.Y 3.3.4.	Create mobile applications that visually represent level-appropriate data based on user input through interfacing with the application

STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 3—Advanced**
CONTENT STANDARD		**Strand: Data, Information, and Security**
PERFORMANCE EXPECTATION		**Content Cluster 4: Students will analyze and utilize concepts of cybersecurity.**
BENCHMARK / PROFICIENCY	CSMD.Y 3.4.5.	Apply digital methods in securely transmitting data by using libraries and/or student-created algorithms

STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 3—Advanced**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSMD.Y 3.5.1.	Design and implement level-appropriate algorithms that solve student-identified problems

STRAND / TOPIC		**Computer Science: Mobile Application Development – Year 3—Advanced**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSMD.Y 3.10.9.	Create and maintain a professional digital portfolio comprised of self-created work

STRAND / TOPIC		**Computer Science: Networking – Year 1**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSNT.Y1. 1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSNT.Y1. 1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity

STRAND / TOPIC		**Computer Science: Networking – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**

BENCHMARK / PROFICIENCY	CSNT.Y1. 5.1.	Design and implement level-appropriate algorithms that use iteration, selection, and sequence
BENCHMARK / PROFICIENCY	CSNT.Y1. 5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms
STRAND / TOPIC		**Computer Science: Networking – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSNT.Y1. 6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Networking – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSNT.Y2. 1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSNT.Y2. 1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
STRAND / TOPIC		**Computer Science: Networking – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSNT.Y2. 5.1.	Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence
BENCHMARK / PROFICIENCY	CSNT.Y2. 5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms including classic search and sort algorithms
STRAND / TOPIC		**Computer Science: Networking – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSNT.Y2. 6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)

STRAND / TOPIC		**Computer Science: Networking – Year 2**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 7: Students will analyze the utilization of computers within industry.**
BENCHMARK / PROFICIENCY	CSNT.Y2.7.1.	Utilize hardware and/or software to solve level-appropriate industry-based problems

STRAND / TOPIC		**Computer Science: Networking – Year 2**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 8: Students will analyze communication methods and systems used to transmit information among computing devices.**
BENCHMARK / PROFICIENCY	CSNT.Y2.8.3.	Design and implement a physical or virtual network of level-appropriate complexity

STRAND / TOPIC		**Computer Science: Networking – Year 3—Advanced**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSNT.Y3.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSNT.Y3.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity

STRAND / TOPIC		**Computer Science: Networking – Year 3—Advanced**
CONTENT STANDARD		**Strand: Data, Information, and Security**
PERFORMANCE EXPECTATION		**Content Cluster 4: Students will analyze and utilize concepts of cybersecurity.**
BENCHMARK / PROFICIENCY	CSNT.Y3.4.2.	Perform and present a network vulnerabilities assessment
BENCHMARK / PROFICIENCY	CSNT.Y3.4.3.	Orchestrate an attack against a controlled network/network environment and provide a findings assessment

STRAND / TOPIC		**Computer Science: Networking – Year 3—Advanced**

CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSNT.Y3.5.1.	Design and implement algorithms for automation of level-appropriate tasks (e.g., adding hosts to a network/domain, setting switch/router configurations, utilizing DevOps)
STRAND / TOPIC		**Computer Science: Networking – Year 3—Advanced**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSNT.Y3.6.1.	Create scripts to solve problems and troubleshoot network issues of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSNT.Y3.6.4.	Create scripts that generate, capture, and analyze network traffic
STRAND / TOPIC		**Computer Science: Programming – Year 1**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSPG.Y1.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSPG.Y1.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
STRAND / TOPIC		**Computer Science: Programming – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSPG.Y1.5.1.	Design and implement level-appropriate algorithms that use iteration, selection, and sequence
BENCHMARK / PROFICIENCY	CSPG.Y1.5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms
STRAND / TOPIC		**Computer Science: Programming – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**

PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSPG.Y1.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Programming – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSPG.Y2.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSPG.Y2.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSPG.Y2.1.5.	Decompose problems of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Programming – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSPG.Y2.5.1.	Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence
BENCHMARK / PROFICIENCY	CSPG.Y2.5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms including classic search and sort algorithms
STRAND / TOPIC		**Computer Science: Programming – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSPG.Y2.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Programming – Year 2**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 7: Students will analyze the utilization of computers within industry.**

BENCHMARK / PROFICIENCY	CSPG.Y2.7.1.	Utilize hardware and/or software to solve level-appropriate industry-based problems

STRAND / TOPIC		**Computer Science: Programming – Year 2**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**

BENCHMARK / PROFICIENCY	CSPG.Y2.10.9.	Create and maintain a digital collection of self-created work

STRAND / TOPIC		**Computer Science: Programming – Year 3—Advanced**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**

BENCHMARK / PROFICIENCY	CSPG.Y3.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSPG.Y3.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSPG.Y3.1.5.	Decompose problems of level-appropriate complexity

STRAND / TOPIC		**Computer Science: Programming – Year 3—Advanced**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**

BENCHMARK / PROFICIENCY	CSPG.Y3.5.1.	Design and implement level-appropriate algorithms that solve student-identified problems

STRAND / TOPIC		**Computer Science: Programming – Year 3—Advanced**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**

BENCHMARK / PROFICIENCY	CSPG.Y3.10.9.	Create and maintain a professional digital portfolio comprised of self-created work

STRAND / TOPIC		**Computer Science: Robotics – Year 1**

CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSRB.Y1.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSRB.Y1.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
STRAND / TOPIC		**Computer Science: Robotics – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSRB.Y1.5.1.	Design and implement level-appropriate algorithms that use iteration, selection, and sequence
BENCHMARK / PROFICIENCY	CSRB.Y1.5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms
STRAND / TOPIC		**Computer Science: Robotics – Year 1**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSRB.Y1.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
STRAND / TOPIC		**Computer Science: Robotics – Year 2**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSRB.Y2.1.1.	Leverage problem-solving strategies to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSRB.Y2.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of appropriate complexity
BENCHMARK / PROFICIENCY	CSRB Y2:	Develop schematics relevant to robotics system architecture
STRAND / TOPIC		**Computer Science: Robotics – Year 2**

CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 2: Students will analyze and utilize connections between concepts of mathematics and computer science.**
BENCHMARK / PROFICIENCY	CSRB.Y2.2.2.	Classify and utilize types of information that are stored in robotics systems including, but not limited to, 2D and 3D coordinate system and sensor data
BENCHMARK / PROFICIENCY	CSRB.Y2.2.7.	Explain how concepts of mechanical engineering including, but not limited to, gear ratios, speed, stability, and torque relate to the implementation of robotics systems and subsystems
STRAND / TOPIC		**Computer Science: Robotics – Year 2**
CONTENT STANDARD		**Strand: Data, Information, and Security**
PERFORMANCE EXPECTATION		**Content Cluster 3: Students will analyze and utilize data through the use of computing devices.**
BENCHMARK / PROFICIENCY	CSRB Y2:	Create programs to store, access, and manipulate level-appropriate robotics system data (e.g., position, sensor input)
STRAND / TOPIC		**Computer Science: Robotics – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSRB.Y2.5.1.	Design and implement level-appropriate algorithms that use iteration, recursion, selection, and sequence
BENCHMARK / PROFICIENCY	CSRB.Y2.5.3.	Evaluate the qualities of level-appropriate student-created and non-student-created algorithms including classic search and sort algorithms
STRAND / TOPIC		**Computer Science: Robotics – Year 2**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSRB.Y2.6.2.	Discuss and apply best practices of program design and format (e.g., descriptive names, documentation, indentation, user experience design, whitespace)
BENCHMARK / PROFICIENCY	CSRB.Y2.6.6.	Create programs that utilize various robotics system operations to solve problems
STRAND / TOPIC		**Computer Science: Robotics – Year 2**

CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 7: Students will analyze the utilization of computers within industry.**
BENCHMARK / PROFICIENCY	CSRB.Y2.7.1.	Utilize hardware and/or software to solve level-appropriate industry-based problems
STRAND / TOPIC		**Computer Science: Robotics – Year 2**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 9: Students will utilize appropriate hardware and software.**
BENCHMARK / PROFICIENCY	CSRB Y2:	Use collaborative tools and processes to configure level-appropriate robotic hardware components
BENCHMARK / PROFICIENCY	CSRB.Y2.9.3.	Analyze the importance and effect of updating firmware and drivers within robotic systems
BENCHMARK / PROFICIENCY	CSRB.Y2.9.4.	Utilize robotic hardware components to create level-appropriate robotic systems and subsystems
BENCHMARK / PROFICIENCY	CSRB.Y2.9.5.	Discuss and apply autonomous and manual robotic control by coding in various robotic programming languages (e.g., C++, Karel, Python)
BENCHMARK / PROFICIENCY	CSRB.Y2.9.6.	Compare and contrast different types of industry-relevant robotic systems (e.g., 3-axis, 6-axis, AMR, cobot, delta, SCARA, T-700)
BENCHMARK / PROFICIENCY	CSRB.Y2.9.7.	Utilize breadboarding in the creation of a level-appropriate closed-loop robot
BENCHMARK / PROFICIENCY	CSRB.Y2.9.8.	Utilize hardware diagnostic tools to design, test, and troubleshoot robotic systems and subsystems
BENCHMARK / PROFICIENCY	CSRB.Y2.9.9.	Discuss hardware and software requirements and limitations of various robotics systems
STRAND / TOPIC		**Computer Science: Robotics – Year 2**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSRB.Y2.10.10.	Create and maintain a digital collection of self-created work
STRAND / TOPIC		**Computer Science: Robotics – Year 2**

CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 11: Students will demonstrate understanding of storytelling with data and appropriately communicate about technical information.**
BENCHMARK / PROFICIENCY	CSRB.Y2.11.2.	Utilize level-appropriate robotic system data for storytelling
BENCHMARK / PROFICIENCY	CSRB.Y2.11.6.	Communicate conditions of a robotic system in terms of performance, diagnostics, troubleshooting, and repair
STRAND / TOPIC		**Computer Science: Robotics – Year 3—Advanced**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 1: Students will analyze and utilize problem-solving strategies.**
BENCHMARK / PROFICIENCY	CSRB.Y3.1.1.	Utilize the engineering design process to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSRB.Y3.1.2.	Analyze and utilize multiple representations of problem-solving logic used to solve problems of level-appropriate complexity, such as schematics and 3D modeling
BENCHMARK / PROFICIENCY	CSRB.Y3.1.3.	Analyze and utilize collaborative methods in problem solving of level-appropriate complexity
STRAND / TOPIC		**Computer Science: Robotics – Year 3—Advanced**
CONTENT STANDARD		**Strand: Computational Thinking and Problem Solving**
PERFORMANCE EXPECTATION		**Content Cluster 2: Students will analyze and utilize connections between concepts of mathematics and computer science.**
BENCHMARK / PROFICIENCY	CSRB.Y3.2.2.	Utilize types of information that are stored in robotics systems including, but not limited to, 2D and 3D coordinate system and sensor data
STRAND / TOPIC		**Computer Science: Robotics – Year 3—Advanced**
CONTENT STANDARD		**Strand: Data, Information, and Security**
PERFORMANCE EXPECTATION		**Content Cluster 3: Students will analyze and utilize data through the use of computing devices.**
BENCHMARK / PROFICIENCY	CSRB.Y3.3.1.	Create programs to store, access, and manipulate, with a high level of efficiency, level-appropriate robotics system data
BENCHMARK / PROFICIENCY	CSRB.Y3.3.2.	Analyze how quantitative and qualitative data are utilized in robotic systems
STRAND / TOPIC		**Computer Science: Robotics – Year 3—Advanced**

CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 5: Students will create, evaluate, and modify algorithms.**
BENCHMARK / PROFICIENCY	CSRB.Y3.5.1.	Design and implement algorithms that solve student-identified problems

STRAND / TOPIC		**Computer Science: Robotics – Year 3—Advanced**
CONTENT STANDARD		**Strand: Algorithms and Programs**
PERFORMANCE EXPECTATION		**Content Cluster 6: Students will create programs to solve problems.**
BENCHMARK / PROFICIENCY	CSRB.Y3.6.1.	Create programs that utilize robotic systems to solve problems of level-appropriate complexity
BENCHMARK / PROFICIENCY	CSRB.Y3.6.4.	Create programs of level-appropriate complexity that leverage real-time sensory input to make decisions for completing physical tasks
BENCHMARK / PROFICIENCY	CSRB.Y3.6.6.	Create programs that utilize various robotics system operations to solve real-world problems

STRAND / TOPIC		**Computer Science: Robotics – Year 3—Advanced**
CONTENT STANDARD		**Strand: Computers and Communications**
PERFORMANCE EXPECTATION		**Content Cluster 9: Students will utilize appropriate hardware and software.**
BENCHMARK / PROFICIENCY	CSRB.Y3.9.2.	Use collaborative tools and processes to configure level-appropriate robotic hardware components
BENCHMARK / PROFICIENCY	CSRB.Y3.9.4.	Utilize robotic hardware components to create level-appropriate robotic systems and subsystems
BENCHMARK / PROFICIENCY	CSRB.Y3.9.7.	Utilize breadboarding and prototyping in the creation of a level-appropriate closed-loop robot
BENCHMARK / PROFICIENCY	CSRB.Y3.9.8.	Utilize hardware diagnostic tools to design, test, and troubleshoot robotic systems and subsystems
BENCHMARK / PROFICIENCY	CSRB.Y3.9.9.	Analyze hardware and software requirements and limitations of various robotics systems

STRAND / TOPIC		**Computer Science: Robotics – Year 3—Advanced**

CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 10: Students will analyze the impacts of technology and professionalism within the computing community.**
BENCHMARK / PROFICIENCY	CSRB.Y3.10.10.	Create and maintain a professional digital portfolio comprised of self-created work
STRAND / TOPIC		**Computer Science: Robotics – Year 3—Advanced**
CONTENT STANDARD		**Strand: Professionalism and Impacts of Computing**
PERFORMANCE EXPECTATION		**Content Cluster 11: Students will demonstrate understanding of storytelling with data and appropriately communicate about technical information.**
BENCHMARK / PROFICIENCY	CSRB.Y3.11.2.	Utilize level-appropriate robotic system data for storytelling
BENCHMARK / PROFICIENCY	CSRB.Y3.11.6.	Communicate conditions of a robotic system in terms of performance, diagnostics, troubleshooting, and repair

California Content Standards

Mathematics

Grade **11** - Adopted: **2013**

CONTENT STANDARD / DOMAIN / PART	**CA.CC.MP.**	**Standards for Mathematical Practice**
PERFORMANCE STANDARD / MODE	MP.1.	Make sense of problems and persevere in solving them.
PERFORMANCE STANDARD / MODE	MP.2.	Reason abstractly and quantitatively.
PERFORMANCE STANDARD / MODE	MP.3.	Construct viable arguments and critique the reasoning of others.
PERFORMANCE STANDARD / MODE	MP.4.	Model with mathematics.
PERFORMANCE STANDARD / MODE	MP.8.	Look for and express regularity in repeated reasoning.
CONTENT STANDARD / DOMAIN / PART	**CA.AI.**	**Algebra I**
PERFORMANCE STANDARD / MODE	**A-CED.**	**Algebra: Creating Equations**

EXPECTATION / SUBSTRAND		**Create equations that describe numbers or relationships. [Linear, quadratic, and exponential (integer inputs only); for A.CED.3 linear only]**
FOUNDATION / PROFICIENCY LEVEL	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CONTENT STANDARD / DOMAIN / PART	**CA.AI.**	**Algebra I**
PERFORMANCE STANDARD / MODE	**A-REI.**	**Algebra: Reasoning with Equations and Inequalities**
EXPECTATION / SUBSTRAND		**Understand solving equations as a process of reasoning and explain the reasoning. [Master linear; learn as general principle.]**
FOUNDATION / PROFICIENCY LEVEL	A-REI.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

CONTENT STANDARD / DOMAIN / PART	**CA.AI.**	**Algebra I**
PERFORMANCE STANDARD / MODE	**F-IF.**	**Functions: Interpreting Functions**
EXPECTATION / SUBSTRAND		**Analyze functions using different representations. [Linear, exponential, quadratic, absolute value, step, piecewise-defined]**
FOUNDATION / PROFICIENCY LEVEL	**F-IF.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
GRADE LEVEL EXPECTATION	F-IF.7.a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

CONTENT STANDARD / DOMAIN / PART	**CA.AI.**	**Algebra I**
PERFORMANCE STANDARD / MODE	**F-LE.**	**Functions: Linear, Quadratic, and Exponential Models**
EXPECTATION / SUBSTRAND		**Construct and compare linear, quadratic, and exponential models and solve problems.**
FOUNDATION / PROFICIENCY LEVEL	**F-LE.1.**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
GRADE LEVEL EXPECTATION	F-LE.1.a.	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

CONTENT STANDARD / DOMAIN / PART	**CA.G.**	**Geometry**
PERFORMANCE STANDARD / MODE	**G-GPE.**	**Geometry: Expressing Geometric Properties with Equations**
EXPECTATION / SUBSTRAND		**Use coordinates to prove simple geometric theorems algebraically. [Include distance formula; relate to Pythagorean Theorem.]**

FOUNDATION / PROFICIENCY LEVEL	G-GPE.5.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

CONTENT STANDARD / DOMAIN / PART	**CA.AII.**	**Algebra II**
PERFORMANCE STANDARD / MODE	**A-CED.**	**Algebra: Creating Equations**
EXPECTATION / SUBSTRAND		**Create equations that describe numbers or relationships. [Equations using all available types of expressions, including simple root functions]**
FOUNDATION / PROFICIENCY LEVEL	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CONTENT STANDARD / DOMAIN / PART	**CA.MI.**	**Mathematics I**
PERFORMANCE STANDARD / MODE	**A-CED.**	**Algebra: Creating Equations**
EXPECTATION / SUBSTRAND		**Create equations that describe numbers or relationships. [Linear and exponential (integer inputs only); for A.CED.3, linear only]**
FOUNDATION / PROFICIENCY LEVEL	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CONTENT STANDARD / DOMAIN / PART	**CA.MI.**	**Mathematics I**
PERFORMANCE STANDARD / MODE	**A-REI.**	**Algebra: Reasoning with Equations and Inequalities**
EXPECTATION / SUBSTRAND		**Understand solving equations as a process of reasoning and explain the reasoning. [Master linear; learn as general principle.]**
FOUNDATION / PROFICIENCY LEVEL	A-REI.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

CONTENT STANDARD / DOMAIN / PART	**CA.MI.**	**Mathematics I**
PERFORMANCE STANDARD / MODE	**F-IF.**	**Functions: Interpreting Functions**
EXPECTATION / SUBSTRAND		**Analyze functions using different representations. [Linear and exponential]**
FOUNDATION / PROFICIENCY LEVEL	**F-IF.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
GRADE LEVEL EXPECTATION	F-IF.7.a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

CONTENT STANDARD / DOMAIN / PART	**CA.MI.**	**Mathematics I**
PERFORMANCE STANDARD / MODE	**F-LE.**	**Functions: Linear, Quadratic, and Exponential Models**
EXPECTATION / SUBSTRAND		**Construct and compare linear, quadratic, and exponential models and solve problems. [Linear and exponential]**
FOUNDATION / PROFICIENCY LEVEL	**F-LE.1.**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
GRADE LEVEL EXPECTATION	F-LE.1.a.	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

CONTENT STANDARD / DOMAIN / PART	**CA.MI.**	**Mathematics I**
PERFORMANCE STANDARD / MODE	**G-GPE.**	**Geometry: Expressing Geometric Properties with Equations**
EXPECTATION / SUBSTRAND		**Use coordinates to prove simple geometric theorems algebraically. [Include distance formula; relate to Pythagorean Theorem.]**
FOUNDATION / PROFICIENCY LEVEL	G-GPE.5.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

CONTENT STANDARD / DOMAIN / PART	**CA.MII.**	**Mathematics II**
PERFORMANCE STANDARD / MODE	**A-CED.**	**Algebra: Creating Equations**
EXPECTATION / SUBSTRAND		**Create equations that describe numbers or relationships.**
FOUNDATION / PROFICIENCY LEVEL	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CONTENT STANDARD / DOMAIN / PART	**CA.MII.**	**Mathematics II**
PERFORMANCE STANDARD / MODE	**F-IF.**	**Functions: Interpreting Functions**
EXPECTATION / SUBSTRAND		**Analyze functions using different representations. [Linear, exponential, quadratic, absolute value, step, piecewise-defined]**
FOUNDATION / PROFICIENCY LEVEL	**F-IF.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
GRADE LEVEL EXPECTATION	F-IF.7.a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.

CONTENT STANDARD / DOMAIN / PART	**CA.MIII.**	**Mathematics III**
PERFORMANCE STANDARD / MODE	**A-CED.**	**Algebra: Creating Equations**
EXPECTATION / SUBSTRAND		**Create equations that describe numbers or relationships. [Equations using all available types of expressions, including simple root functions]**
FOUNDATION / PROFICIENCY LEVEL	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CONTENT STANDARD / DOMAIN / PART	**CA.PC.**	**Precalculus**
PERFORMANCE STANDARD / MODE	**A-CED.**	**Algebra: Creating Equations**
EXPECTATION / SUBSTRAND		**Create equations that describe numbers or relationships.**
FOUNDATION / PROFICIENCY LEVEL	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

California Content Standards

Science

Grade **11** - Adopted: **2013**

CONTENT STANDARD / DOMAIN / PART	**CA.HS-PS.**	**PHYSICAL SCIENCE**
PERFORMANCE STANDARD / MODE	**HS-PS1.**	**Matter and Its Interactions**
EXPECTATION / SUBSTRAND		**Students who demonstrate understanding can:**
FOUNDATION / PROFICIENCY LEVEL	HS-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

CONTENT STANDARD / DOMAIN / PART	**CA.HS-PS.**	**PHYSICAL SCIENCE**
PERFORMANCE STANDARD / MODE	**HS-PS3.**	**Energy**
EXPECTATION / SUBSTRAND		**Students who demonstrate understanding can:**
FOUNDATION / PROFICIENCY LEVEL	HS-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

CONTENT STANDARD / DOMAIN / PART	**CA.HS-PS.**	**PHYSICAL SCIENCE**

PERFORMANCE STANDARD / MODE	**HS-PS4.**	**Waves and Their Applications in Technologies for Information Transfer**
EXPECTATION / SUBSTRAND		**Students who demonstrate understanding can:**
FOUNDATION / PROFICIENCY LEVEL	HS-PS4-2.	Evaluate questions about the advantages of using a digital transmission and storage of information.

CONTENT STANDARD / DOMAIN / PART	**CA.HS-LS.**	**LIFE SCIENCE**
PERFORMANCE STANDARD / MODE	**HS-LS2.**	**Ecosystems: Interactions, Energy, and Dynamics**
EXPECTATION / SUBSTRAND		**Students who demonstrate understanding can:**
FOUNDATION / PROFICIENCY LEVEL	HS-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

CONTENT STANDARD / DOMAIN / PART	**CA.HS-ESS.**	**EARTH AND SPACE SCIENCE**
PERFORMANCE STANDARD / MODE	**HS-ESS2.**	**Earth's Systems**
EXPECTATION / SUBSTRAND		**Students who demonstrate understanding can:**
FOUNDATION / PROFICIENCY LEVEL	HS-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

CONTENT STANDARD / DOMAIN / PART	**CA.HS-ESS.**	**EARTH AND SPACE SCIENCE**
PERFORMANCE STANDARD / MODE	**HS-ESS3.**	**Earth and Human Activity**
EXPECTATION / SUBSTRAND		**Students who demonstrate understanding can:**
FOUNDATION / PROFICIENCY LEVEL	HS-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
FOUNDATION / PROFICIENCY LEVEL	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
FOUNDATION / PROFICIENCY LEVEL	HS-ESS3-3.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

FOUNDATION / PROFICIENCY LEVEL	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
FOUNDATION / PROFICIENCY LEVEL	HS-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
CONTENT STANDARD / DOMAIN / PART	**CA.HS-ETS.**	**ENGINEERING DESIGN**
PERFORMANCE STANDARD / MODE	**HS-ETS1.**	**Engineering Design**
EXPECTATION / SUBSTRAND		**Students who demonstrate understanding can:**
FOUNDATION / PROFICIENCY LEVEL	HS-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
FOUNDATION / PROFICIENCY LEVEL	HS-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
FOUNDATION / PROFICIENCY LEVEL	HS-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
CONTENT STANDARD / DOMAIN / PART	**CA.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
PERFORMANCE STANDARD / MODE		**Key Ideas and Details**
EXPECTATION / SUBSTRAND	RST.11-12.2.	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
EXPECTATION / SUBSTRAND	RST.11-12.3.	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CONTENT STANDARD / DOMAIN / PART	**CA.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
PERFORMANCE STANDARD / MODE		**Craft and Structure**
EXPECTATION / SUBSTRAND	RST.11-12.4.	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
EXPECTATION / SUBSTRAND	RST.11-12.5.	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

CONTENT STANDARD / DOMAIN / PART	**CA.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
PERFORMANCE STANDARD / MODE		**Integration of Knowledge and Ideas**
EXPECTATION / SUBSTRAND	RST.11-12.9.	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

CONTENT STANDARD / DOMAIN / PART	**CA.RST.11-12.**	**Reading Standards for Literacy in Science and Technical Subjects**
PERFORMANCE STANDARD / MODE		**Range of Reading and Level of Text Complexity**
EXPECTATION / SUBSTRAND	RST.11-12.10.	By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

CONTENT STANDARD / DOMAIN / PART	**CA.WHST.11-12.**	**Writing Standards for Literacy in Science and Technical Subjects**
PERFORMANCE STANDARD / MODE		**Text Types and Purposes**
EXPECTATION / SUBSTRAND	**WHST.11-12.2.**	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**
FOUNDATION / PROFICIENCY LEVEL	WHST.11-12.2.d.	Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

CONTENT STANDARD / DOMAIN / PART	**CA.WHST.11-12.**	**Writing Standards for Literacy in Science and Technical Subjects**
PERFORMANCE STANDARD / MODE		**Production and Distribution of Writing**
EXPECTATION / SUBSTRAND	WHST.11-12.4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
EXPECTATION / SUBSTRAND	WHST.11-12.6.	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

California Content Standards

Technology Education

Grade **11** - Adopted: **2018**

CONTENT STANDARD / DOMAIN / PART		**Computer Science Core Practices**
PERFORMANCE STANDARD / MODE	**P3.**	**Core Practice 3 – Recognizing and Defining Computational Problems**

EXPECTATION / SUBSTRAND	P3.1.	Identify complex, interdisciplinary, real-world problems that can be solved computationally.

CONTENT STANDARD / DOMAIN / PART		**Computer Science Standards – Core**
PERFORMANCE STANDARD / MODE		**Algorithms & Programming**
EXPECTATION / SUBSTRAND		**Algorithms**
FOUNDATION / PROFICIENCY LEVEL	9-12.AP.12.	Design algorithms to solve computational problems using a combination of original and existing algorithms. (P4.2, P5.1)

CONTENT STANDARD / DOMAIN / PART		**Computer Science Standards – Specialty**
PERFORMANCE STANDARD / MODE		**Algorithms & Programming**
EXPECTATION / SUBSTRAND		**Modularity**
FOUNDATION / PROFICIENCY LEVEL	9-12S.AP.17.	Construct solutions to problems using student-created components, such as procedures, modules, and/or objects. (P4.3, P5.2)

Colorado Academic Standards (CAS)

Mathematics

Grade **11** - Adopted: **2018**

CONTENT AREA		**Prepared Graduates in Mathematics**
STANDARD	MP1.	Make sense of problems and persevere in solving them.
STANDARD	MP2.	Reason abstractly and quantitatively.
STANDARD	MP3.	Construct viable arguments and critique the reasoning of others.
STANDARD	MP4.	Model with mathematics.
STANDARD	MP8.	Look for and express regularity in repeated reasoning.

CONTENT AREA		**High School, Standard 2. Algebra and Functions**
STANDARD	**HS.A-CED.A.**	**Creating Equations: Create equations that describe numbers or relationships.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**

EVIDENCE OUTCOMES	HS.A-CED.A.2.	Create equations in two or more variables to represent relationships between quantities and graph equations on coordinate axes with labels and scales. (CCSS: HS.A-CED.A.2)
CONTENT AREA		**High School, Standard 2. Algebra and Functions**
STANDARD	**HS.A-REI.A.**	**Reasoning with Equations & Inequalities: Understand solving equations as a process of reasoning and explain the reasoning.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES	HS.A-REI.A.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. (CCSS: HS.A-REI.A.1)
CONTENT AREA		**High School, Standard 2. Algebra and Functions**
STANDARD	**HS.F-IF.B.**	**Interpreting Functions: Interpret functions that arise in applications in terms of the context.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES	HS.F-IF.B.6.	Calculate and interpret the average rate of change presented symbolically or as a table, of a function over a specified interval. Estimate the rate of change from a graph. (CCSS: HS.F-IF.B.6)
CONTENT AREA		**High School, Standard 2. Algebra and Functions**
STANDARD	**HS.F-IF.C.**	**Interpreting Functions: Analyze functions using different representations.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES	**HS.F-IF.C.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (CCSS: HS.F-IF.C.7)**
INDICATOR	HS.F-IF.C.7.a.	Graph linear and quadratic functions and show intercepts, maxima, and minima. (CCSS: HS.F-IF.C.7.a)
CONTENT AREA		**High School, Standard 2. Algebra and Functions**
STANDARD	**HS.F-LE.A.**	**Linear, Quadratic & Exponential Models: Construct and compare linear, quadratic, and exponential models and solve problems.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES	**HS.F-LE.A.1.**	**Distinguish between situations that can be modeled with linear functions and with exponential functions. (CCSS: HS.F-LE.A.1)**
INDICATOR	HS.F-LE.A.1.a.	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. (CCSS: HS.F-LE.A.1.a)

CONTENT AREA		**High School, Standard 4. Geometry**
STANDARD	**HS.G-GPE.B.**	**Expressing Geometric Properties with Equations: Use coordinates to prove simple geometric theorems algebraically.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	HS.G-GPE.B.5.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). (CCSS: HS.G-GPE.B.5)

Colorado Academic Standards (CAS)

Science

Grade **11** - Adopted: **2018**

CONTENT AREA		**Prepared Graduates in Science**
STANDARD	1	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding structure, properties and interactions of matter.
STANDARD	2	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding interactions between objects and within systems of objects.
STANDARD	3	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how energy is transferred and conserved.
STANDARD	4	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how waves are used to transfer energy and information.
STANDARD	5	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how individual organisms are configured and how these structures function to support life, growth, behavior and reproduction.
STANDARD	6	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how living systems interact with the biotic and abiotic environment.
STANDARD	7	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how genetic and environmental factors influence variation of organisms across generations.
STANDARD	8	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how natural selection drives biological evolution accounting for the unity and diversity of organisms.
STANDARD	9	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding the universe and Earth's place in it.
STANDARD	10	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how and why Earth is constantly changing.

STANDARD	11	Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how human activities and the Earth's surface processes interact.

CONTENT AREA	**SC.HS.1.**	**Physical Science**
STANDARD	**SC.HS.1.1.**	**The sub-atomic structural model and interactions between electric charges at the atomic scale can be used to explain the structure and interactions of matter.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	SC.HS.1.1.c.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. (HS-PS1-4)

CONTENT AREA	**SC.HS.1.**	**Physical Science**
STANDARD	**SC.HS.1.2.**	**Chemical processes, their rates, their outcomes, and whether or not energy is stored or released can be understood in terms of collisions of molecules, rearrangement of atoms, and changes in energy as determined by properties of elements involved.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	SC.HS.1.2.b.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. (HS-PS1-4)

CONTENT AREA	**SC.HS.1.**	**Physical Science**
STANDARD	**SC.HS.1.6.**	**Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	SC.HS.1.6.c.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. (HS-PS3-3)

CONTENT AREA	**SC.HS.1.**	**Physical Science**
STANDARD	**SC.HS.1.9.**	**Although energy cannot be destroyed, it can be converted to less useful forms as it is captured, stored and transferred.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**

INDICATOR	SC.HS.1.9.a.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. (HS-PS3-3)

CONTENT AREA	**SC.HS.1.**	**Physical Science**
STANDARD	**SC.HS.1.10.**	**Waves have characteristic properties and behaviors.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**

INDICATOR	SC.HS.1.10.b.	Evaluate questions about the advantages of using a digital transmission and storage of information. (HS-PS4-2)

CONTENT AREA	**SC.HS.2.**	**Life Science**
STANDARD	**SC.HS.2.6.**	**A complex set of interactions determine how ecosystems respond to disturbances.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**

INDICATOR	SC.HS.2.6.b.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. (HS-LS2-7)

CONTENT AREA	**SC.HS.3.**	**Earth and Space Science**
STANDARD	**SC.HS.3.4.**	**Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes, and these effects occur on different time scales, from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**

INDICATOR	SC.HS.3.4.d.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. (HS-ESS2-4)

CONTENT AREA	**SC.HS.3.**	**Earth and Space Science**
STANDARD	**SC.HS.3.7.**	**The role of radiation from the sun and its interactions with the atmosphere, ocean, and land are the foundation for the global climate system. Global climate models are used to predict future changes, including changes influenced by human behavior and natural factors.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**

INDICATOR	SC.HS.3.7.b.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. (HS-ESS2-4)

CONTENT AREA	**SC.HS.3.**	**Earth and Space Science**
STANDARD	**SC.HS.3.9.**	**Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	SC.HS.3.9.a.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. (HS-ESS3-1)
INDICATOR	SC.HS.3.9.b.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. (HS-ESS3-2)

CONTENT AREA	**SC.HS.3.**	**Earth and Space Science**
STANDARD	**SC.HS.3.10.**	**Natural hazards and other geological events have shaped the course of human history at local, regional, and global scales.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	SC.HS.3.10.a.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. (HS-ESS3-1)

CONTENT AREA	**SC.HS.3.**	**Earth and Space Science**
STANDARD	**SC.HS.3.11.**	**Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources, including the development of technologies.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	SC.HS.3.11.a.	Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. (HS-ESS3-3)
INDICATOR	SC.HS.3.11.b.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. (HS-ESS3-4)

CONTENT AREA	**SC.HS.3.**	**Earth and Space Science**
STANDARD	**SC.HS.3.12.**	**Global climate models used to predict future climate change continue to improve our understanding of the impact of human activities on the global climate system.**

CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	SC.HS.3.12.b.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. (HS-ESS3-6)

Colorado Academic Standards (CAS)

Technology Education

Grade **11** - Adopted: **2018**

CONTENT AREA		**Prepared Graduates in Computer Science**
STANDARD	1	Develop, utilize and evaluate algorithms, to model and solve problems.

CONTENT AREA		**High School, Standard 1. Computational Thinking**
STANDARD	**CS.HS.1.1**	**Computational thinking is used to create algorithmic solutions to real-world problems.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	CS.HS.1.1.a.	Identify and create different types of algorithms (sort, search, etc.).
INDICATOR	CS.HS.1.1.c.	Create or adapt algorithms to solve problems for multiple purposes (e.g., personal interests, client needs).
INDICATOR	CS.HS.1.1.f.	Recognize problems that cannot be solved computationally.
INDICATOR	CS.HS.1.1.g.	Identify and describe algorithms that exist within their personal lives.

CONTENT AREA		**High School, Standard 1. Computational Thinking**
STANDARD	**CS.HS.1.5**	**Abstraction is used to reduce complexity of larger problems by focusing on main ideas.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	CS.HS.1.5.a.	Describe how abstraction is central to computational thinking.

INDICATOR	CS.HS.1.5.b.	Identify and prioritize the most relevant parts of a problem while filtering out extraneous details.
INDICATOR	CS.HS.1.5.c.	Demonstrate different ways to represent key problem components.

CONTENT AREA		**High School, Standard 2. Computing Systems and Networks**
STANDARD	**CS.HS.2.5**	**Client considerations drive system design.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	CS.HS.2.5.a.	Identify client's problems/needs.
INDICATOR	CS.HS.2.5.b.	Articulate design requirements back to client.

CONTENT AREA		**High School, Standard 3. Computer Programming**
STANDARD	**CS.HS.3.1**	**The creation of a computer program requires a design process.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	CS.HS.3.1.a.	Analyze and apply a design methodology to identify constraints and requirements of an identified problem.

CONTENT AREA		**High School, Standard 3. Computer Programming**
STANDARD	**CS.HS.3.4**	**Client-based design requirements and feedback are essential to a quality computational product or service.**
CONCEPTS AND SKILLS / EVIDENCE OUTCOMES		**Evidence Outcomes**
EVIDENCE OUTCOMES		**Students Can:**
INDICATOR	CS.HS.3.4.a.	Understand and apply principles of client-based design.

DOMAIN / CONTENT STANDARD	CT.CC.MP.	Mathematical Practices
STATE FRAMEWORK	MP-1.	Make sense of problems and persevere in solving them.
STATE FRAMEWORK	MP-2.	Reason abstractly and quantitatively.
STATE FRAMEWORK	MP-3.	Construct viable arguments and critique the reasoning of others.
STATE FRAMEWORK	MP-4.	Model with mathematics.
STATE FRAMEWORK	MP-8.	Look for and express regularity in repeated reasoning.

DOMAIN / CONTENT STANDARD	CT.CC.A.	Algebra
STATE FRAMEWORK	**A-CED.**	**Creating Equations**
GRADE LEVEL EXPECTATION		**Create equations that describe numbers or relationships.**
INDICATOR	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

DOMAIN / CONTENT STANDARD	CT.CC.A.	Algebra
STATE FRAMEWORK	**A-REI.**	**Reasoning with Equations and Inequalities**
GRADE LEVEL EXPECTATION		**Understand solving equations as a process of reasoning and explain the reasoning.**
INDICATOR	A-REI.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

DOMAIN / CONTENT STANDARD	CT.CC.F.	Functions
STATE FRAMEWORK	**F-IF.**	**Interpreting Functions**
GRADE LEVEL EXPECTATION		**Analyze functions using different representations.**
INDICATOR	**F-IF.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
INDICATOR	F-IF.7(a)	Graph linear and quadratic functions and show intercepts, maxima, and minima.

DOMAIN / CONTENT STANDARD	**CT.CC.F.**	**Functions**
STATE FRAMEWORK	**F-LE.**	**Linear, Quadratic, & Exponential Models**
GRADE LEVEL EXPECTATION		**Construct and compare linear and exponential models and solve problems.**
INDICATOR	**F-LE.1.**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
INDICATOR	F-LE.1(a)	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

DOMAIN / CONTENT STANDARD	**CT.CC.G.**	**Geometry**
STATE FRAMEWORK	**G-GPE.**	**Expressing Geometric Properties with Equations**
GRADE LEVEL EXPECTATION		**Use coordinates to prove simple geometric theorems algebraically**
INDICATOR	G-GPE.5.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Connecticut State Standards

Science

Grade **11** - Adopted: **2015**

DOMAIN / CONTENT STANDARD	**NGSS.HS-PS.**	**PHYSICAL SCIENCE**
STATE FRAMEWORK	**HS-PS1.**	**Matter and Its Interactions**
GRADE LEVEL EXPECTATION		**Students who demonstrate understanding can:**
INDICATOR	HS-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

DOMAIN / CONTENT STANDARD	**NGSS.HS-PS.**	**PHYSICAL SCIENCE**
STATE FRAMEWORK	**HS-PS3.**	**Energy**
GRADE LEVEL EXPECTATION		**Students who demonstrate understanding can:**
INDICATOR	HS-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

DOMAIN / CONTENT STANDARD	**NGSS.HS-PS.**	**PHYSICAL SCIENCE**
STATE FRAMEWORK	**HS-PS4.**	**Waves and Their Applications in Technologies for Information Transfer**

GRADE LEVEL EXPECTATION		**Students who demonstrate understanding can:**
INDICATOR	HS-PS4-2.	Evaluate questions about the advantages of using a digital transmission and storage of information.
DOMAIN / CONTENT STANDARD	**NGSS.HS-LS.**	**LIFE SCIENCE**
STATE FRAMEWORK	**HS-LS2.**	**Ecosystems: Interactions, Energy, and Dynamics**
GRADE LEVEL EXPECTATION		**Students who demonstrate understanding can:**
INDICATOR	HS-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
DOMAIN / CONTENT STANDARD	**NGSS.HS-ESS.**	**EARTH AND SPACE SCIENCE**
STATE FRAMEWORK	**HS-ESS2.**	**Earth's Systems**
GRADE LEVEL EXPECTATION		**Students who demonstrate understanding can:**
INDICATOR	HS-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
DOMAIN / CONTENT STANDARD	**NGSS.HS-ESS.**	**EARTH AND SPACE SCIENCE**
STATE FRAMEWORK	**HS-ESS3.**	**Earth and Human Activity**
GRADE LEVEL EXPECTATION		**Students who demonstrate understanding can:**
INDICATOR	HS-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
INDICATOR	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
INDICATOR	HS-ESS3-3.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
INDICATOR	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
INDICATOR	HS-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
DOMAIN / CONTENT STANDARD	**NGSS.HS-ETS.**	**ENGINEERING DESIGN**
STATE FRAMEWORK	**HS-ETS1.**	**Engineering Design**

GRADE LEVEL EXPECTATION		Students who demonstrate understanding can:
INDICATOR	HS-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
INDICATOR	HS-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
INDICATOR	HS-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Connecticut State Standards
Technology Education
Grade **11** - Adopted: **2017**

DOMAIN / CONTENT STANDARD		CSTA K-12 Computer Science Standards
STATE FRAMEWORK	CSTA.3B.	Level 3B (Ages 17-18)
GRADE LEVEL EXPECTATION	3B-AP.	Algorithms & Programming
INDICATOR		Algorithms
INDICATOR	3B-AP-09.	Implement an artificial intelligence algorithm to play a game against a human opponent or solve a problem. (P5.3)
INDICATOR	3B-AP-10.	Use and adapt classic algorithms to solve computational problems. (P4.2)

DOMAIN / CONTENT STANDARD		CSTA K-12 Computer Science Standards
STATE FRAMEWORK	CSTA.3B.	Level 3B (Ages 17-18)
GRADE LEVEL EXPECTATION	3B-AP.	Algorithms & Programming
INDICATOR		Modularity
INDICATOR	3B-AP-14.	Construct solutions to problems using student-created components, such as procedures, modules and/or objects. (P5.2)

DOMAIN / CONTENT STANDARD		CSTA K-12 Computer Science Standards
STATE FRAMEWORK	CSTA.3B.	Level 3B (Ages 17-18)
GRADE LEVEL EXPECTATION	3B-AP.	Algorithms & Programming
INDICATOR		Program Development

INDICATOR	3B-AP-17.	Plan and develop programs for broad audiences using a software life cycle process. (P5.1)

Grade **11** - Adopted: **2016**

DOMAIN / CONTENT STANDARD		**ISTE for Students (ISTE-S)**
STATE FRAMEWORK	**CO.ISTE-S.3.**	**Knowledge Constructors: Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.**
GRADE LEVEL EXPECTATION	ISTE-S.3.d.	Build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

DOMAIN / CONTENT STANDARD		**ISTE for Students (ISTE-S)**
STATE FRAMEWORK	**CO.ISTE-S.4.**	**Innovative Designers: Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.**
GRADE LEVEL EXPECTATION	ISTE-S.4.a.	Know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
GRADE LEVEL EXPECTATION	ISTE-S.4.b.	Select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

DOMAIN / CONTENT STANDARD		**ISTE for Students (ISTE-S)**
STATE FRAMEWORK	**CO.ISTE-S.5.**	**Computational Thinkers: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.**
GRADE LEVEL EXPECTATION	ISTE-S.5.a.	Formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.
GRADE LEVEL EXPECTATION	ISTE-S.5.b.	Collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
GRADE LEVEL EXPECTATION	ISTE-S.5.d.	Understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

Delaware Standards and Instruction

Mathematics

Grade **11** - Adopted: **2010**

STANDARD / STRAND	**DE.CC.9-12.MP.**	**Mathematical Practices**
STRAND / INDICATOR	CC.9-12.MP-1.	Make sense of problems and persevere in solving them.
STRAND / INDICATOR	CC.9-12.MP-2.	Reason abstractly and quantitatively.
STRAND / INDICATOR	CC.9-12.MP-3.	Construct viable arguments and critique the reasoning of others.

STRAND / INDICATOR	CC.9-12.MP-4.	Model with mathematics.
STRAND / INDICATOR	CC.9-12.MP-8.	Look for and express regularity in repeated reasoning.
STANDARD / STRAND	**DE.CC.9-12.A.**	**Algebra**
STRAND / INDICATOR	**CC.9-12.A-CED.**	**Creating Equations**
ENDURING UNDERSTANDING		**Create equations that describe numbers or relationships.**
BENCHMARK	CC.9-12.A.CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
STANDARD / STRAND	**DE.CC.9-12.A.**	**Algebra**
STRAND / INDICATOR	**CC.9-12.A-REI.**	**Reasoning with Equations and Inequalities**
ENDURING UNDERSTANDING		**Understand solving equations as a process of reasoning and explain the reasoning.**
BENCHMARK	CC.9-12.A.REI.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
STANDARD / STRAND	**DE.CC.9-12.F.**	**Functions**
STRAND / INDICATOR	**CC.9-12.F-IF.**	**Interpreting Functions**
ENDURING UNDERSTANDING		**Analyze functions using different representations.**
BENCHMARK	**CC.9-12.F.IF.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
EXPECTATION	CC.9-12.F.IF.7a.	Graph linear and quadratic functions and show intercepts, maxima, and minima.
STANDARD / STRAND	**DE.CC.9-12.F.**	**Functions**
STRAND / INDICATOR	**CC.9-12.F-LE.**	**Linear and Exponential Models**
ENDURING UNDERSTANDING		**Construct and compare linear and exponential models and solve problems.**
BENCHMARK	**CC.9-12.F.LE.1.**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**

EXPECTATION	CC.9-12.F.LE.1a.	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

STANDARD / STRAND	**DE.CC.9-12.G.**	**Geometry**
STRAND / INDICATOR	**CC.9-12.G-GPE.**	**Expressing Geometric Properties with Equations**
ENDURING UNDERSTANDING		**Use coordinates to prove simple geometric theorems algebraically**

BENCHMARK	CC.9-12.G.GPE.5.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Delaware Standards and Instruction

Science

Grade **11** - Adopted: **2013**

STANDARD / STRAND	**DE.HS-PS.**	**PHYSICAL SCIENCE**
STRAND / INDICATOR	**HS-PS1.**	**Matter and Its Interactions**
ENDURING UNDERSTANDING		**Students who demonstrate understanding can:**

BENCHMARK	HS-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

STANDARD / STRAND	**DE.HS-PS.**	**PHYSICAL SCIENCE**
STRAND / INDICATOR	**HS-PS3.**	**Energy**
ENDURING UNDERSTANDING		**Students who demonstrate understanding can:**

BENCHMARK	HS-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

STANDARD / STRAND	**DE.HS-PS.**	**PHYSICAL SCIENCE**
STRAND / INDICATOR	**HS-PS4.**	**Waves and Their Applications in Technologies for Information Transfer**
ENDURING UNDERSTANDING		**Students who demonstrate understanding can:**

BENCHMARK	HS-PS4-2.	Evaluate questions about the advantages of using a digital transmission and storage of information.

STANDARD / STRAND	**DE.HS-LS.**	**LIFE SCIENCE**

STRAND / INDICATOR	**HS-LS2.**	**Ecosystems: Interactions, Energy, and Dynamics**
ENDURING UNDERSTANDING		**Students who demonstrate understanding can:**
BENCHMARK	HS-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
STANDARD / STRAND	**DE.HS-ESS.**	**EARTH AND SPACE SCIENCE**
STRAND / INDICATOR	**HS-ESS2.**	**Earth's Systems**
ENDURING UNDERSTANDING		**Students who demonstrate understanding can:**
BENCHMARK	HS-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
STANDARD / STRAND	**DE.HS-ESS.**	**EARTH AND SPACE SCIENCE**
STRAND / INDICATOR	**HS-ESS3.**	**Earth and Human Activity**
ENDURING UNDERSTANDING		**Students who demonstrate understanding can:**
BENCHMARK	HS-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
BENCHMARK	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
BENCHMARK	HS-ESS3-3.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
BENCHMARK	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
BENCHMARK	HS-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
STANDARD / STRAND	**DE.HS-ETS.**	**ENGINEERING DESIGN**
STRAND / INDICATOR	**HS-ETS1.**	**Engineering Design**
ENDURING UNDERSTANDING		**Students who demonstrate understanding can:**
BENCHMARK	HS-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

BENCHMARK	HS-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
BENCHMARK	HS-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Grade **11** - Adopted: **2010**

STANDARD / STRAND	**DE.CC11-12RS/TS.**	**Reading Standards for Literacy in Science and Technical Subjects 6-12**
STRAND / INDICATOR		**Key Ideas and Details**
ENDURING UNDERSTANDING	CC11-12RS/TS2.	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
ENDURING UNDERSTANDING	CC11-12RS/TS3.	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

STANDARD / STRAND	**DE.CC11-12RS/TS.**	**Reading Standards for Literacy in Science and Technical Subjects 6-12**
STRAND / INDICATOR		**Craft and Structure**
ENDURING UNDERSTANDING	CC11-12RS/TS4.	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
ENDURING UNDERSTANDING	CC11-12RS/TS5.	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

STANDARD / STRAND	**DE.CC11-12RS/TS.**	**Reading Standards for Literacy in Science and Technical Subjects 6-12**
STRAND / INDICATOR		**Integration of Knowledge and Ideas**
ENDURING UNDERSTANDING	CC11-12RS/TS9.	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

STANDARD / STRAND	**DE.CC11-12RS/TS.**	**Reading Standards for Literacy in Science and Technical Subjects 6-12**
STRAND / INDICATOR		**Range of Reading and Level of Text Complexity**
ENDURING UNDERSTANDING	CC11-12RS/TS10.	By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

STANDARD / STRAND	**DE.CC11-12WH/S/TS.**	**Writing Standards for Literacy in Science and Technical Subjects 6-12**

STRAND / INDICATOR		**Text Types and Purposes**
ENDURING UNDERSTANDING	**CC11-12WH/S/TS2.**	**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**
BENCHMARK	CC11-12WH/S/TS2d.	Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

STANDARD / STRAND	**DE.CC11-12WH/S/TS.**	**Writing Standards for Literacy in Science and Technical Subjects 6-12**
STRAND / INDICATOR		**Production and Distribution of Writing**
ENDURING UNDERSTANDING	CC11-12WH/S/TS4.	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
ENDURING UNDERSTANDING	CC11-12WH/S/TS6.	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Delaware Standards and Instruction

Technology Education

Grade **11** - Adopted: **2018**

STANDARD / STRAND		**Computer Science Content Standards**
STRAND / INDICATOR	**CSTA.3B.**	**Level 3B (Ages 17-18)**
ENDURING UNDERSTANDING	**3B-AP.**	**Algorithms & Programming**
BENCHMARK		**Algorithms**
EXPECTATION	3B-AP-09.	Implement an artificial intelligence algorithm to play a game against a human opponent or solve a problem. (P5.3)
EXPECTATION	3B-AP-10.	Use and adapt classic algorithms to solve computational problems. (P4.2)

STANDARD / STRAND		**Computer Science Content Standards**
STRAND / INDICATOR	**CSTA.3B.**	**Level 3B (Ages 17-18)**
ENDURING UNDERSTANDING	**3B-AP.**	**Algorithms & Programming**
BENCHMARK		**Modularity**
EXPECTATION	3B-AP-14.	Construct solutions to problems using student-created components, such as procedures, modules and/or objects. (P5.2)

STANDARD / STRAND		Computer Science Content Standards
STRAND / INDICATOR	CSTA.3 B.	Level 3B (Ages 17-18)
ENDURING UNDERSTANDING	3B-AP.	Algorithms & Programming
BENCHMARK		Program Development
EXPECTATION	3B-AP-17.	Plan and develop programs for broad audiences using a software life cycle process. (P5.1)

Florida Standards

Mathematics

Grade **11** - Adopted: **2020**

BODY OF KNOWLEDGE		Mathematical Thinking and Reasoning
BIG IDEA		Standard 1: Actively participate in effortful learning both individually and collectively.
BENCHMARK	MA.K12.MTR.1.1	Mathematicians who participate in effortful learning both individually and with others:
INDICATOR	MA.K12.MTR.1.1a	Analyze the problem in a way that makes sense given the task.
INDICATOR	MA.K12.MTR.1.1b	Ask questions that will help with solving the task.
INDICATOR	MA.K12.MTR.1.1c	Build perseverance by modifying methods as needed while solving a challenging task.
INDICATOR	MA.K12.MTR.1.1d	Stay engaged and maintain a positive mindset when working to solve tasks.
INDICATOR	MA.K12.MTR.1.1e	Help and support each other when attempting a new method or approach.

BODY OF KNOWLEDGE		Mathematical Thinking and Reasoning
BIG IDEA		Standard 2: Demonstrate understanding by representing problems in multiple ways.
BENCHMARK	MA.K12.MTR.2.1	Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
INDICATOR	MA.K12.MTR.2.1a	Build understanding through modeling and using manipulatives.
INDICATOR	MA.K12.MTR.2.1b	Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
INDICATOR	MA.K12.MTR.2.1d	Express connections between concepts and representations.

INDICATOR	MA.K12.MTR.2.1e	Choose a representation based on the given context or purpose.

BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 3: Complete tasks with mathematical fluency.**
BENCHMARK	**MA.K12.MTR.3.1**	**Complete tasks with mathematical fluency.Mathematicians who complete tasks with mathematical fluency:**
INDICATOR	MA.K12.MTR.3.1a	Select efficient and appropriate methods for solving problems within the given context.

BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 4: Engage in discussions that reflect on the mathematical thinking of self and others.**
BENCHMARK	**MA.K12.MTR.4.1**	**Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:**
INDICATOR	MA.K12.MTR.4.1a	Communicate mathematical ideas, vocabulary and methods effectively.
INDICATOR	MA.K12.MTR.4.1b	Analyze the mathematical thinking of others.
INDICATOR	MA.K12.MTR.4.1c	Compare the efficiency of a method to those expressed by others.
INDICATOR	MA.K12.MTR.4.1e	Justify results by explaining methods and processes.

BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 5: Use patterns and structure to help understand and connect mathematical concepts.**
BENCHMARK	**MA.K12.MTR.5.1**	**Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:**
INDICATOR	MA.K12.MTR.5.1a	Focus on relevant details within a problem.
INDICATOR	MA.K12.MTR.5.1c	Decompose a complex problem into manageable parts.

BODY OF KNOWLEDGE		**Mathematical Thinking and Reasoning**
BIG IDEA		**Standard 7: Apply mathematics to real-world contexts.**
BENCHMARK	**MA.K12.MTR.7.1**	**Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:**
INDICATOR	MA.K12.MTR.7.1a	Connect mathematical concepts to everyday experiences.

INDICATOR	MA.K12.MTR.7.1b	Use models and methods to understand, represent and solve problems.
INDICATOR	MA.K12.MTR.7.1c	Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.
BODY OF KNOWLEDGE		**Algebraic Reasoning**
BIG IDEA		**Standard 2: Write, solve and graph linear equations, functions and inequalities in one and two variables.**
BENCHMARK	MA.912.AR.2.3	Write a linear two-variable equation for a line that is parallel or perpendicular to a given line and goes through a given point.
BENCHMARK	MA.912.AR.2.4	Given a table, equation or written description of a linear function, graph that function, and determine and interpret its key features.
BENCHMARK	MA.912.AR.2.5	Solve and graph mathematical and real-world problems that are modeled with linear functions. Interpret key features and determine constraints in terms of the context.
BODY OF KNOWLEDGE		**Logic and Discrete Theory**
BIG IDEA		**Standard 4: Develop an understanding of the fundamentals of propositional logic, arguments and methods of proof.**
BENCHMARK	MA.912.LT.4.7	Identify and give examples of undefined terms; axioms; theorems; proofs, including proofs using mathematical induction; and inductive and deductive reasoning.

Florida Standards

Science

Grade **11** - Adopted: **2008**

BODY OF KNOWLEDGE	**FL.SC.912.N.**	**Nature of Science**
BIG IDEA	**SC.912.N.1.**	**The Practice of Science - A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation. B: The processes of science frequently do not correspond to the traditional portrayal of "the scientific method." C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge. D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.**
BENCHMARK	**SC.912.N.1.1.**	**Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:**
INDICATOR	SC.912.N.1.1.6.	Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs)
INDICATOR	SC.912.N.1.1.7.	Pose answers, explanations, or descriptions of events
BODY OF KNOWLEDGE	**FL.SC.912.N.**	**Nature of Science**

BIG IDEA	**SC.912.N.1.**	**The Practice of Science - A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation. B: The processes of science frequently do not correspond to the traditional portrayal of ''the scientific method.'' C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge. D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.**
BENCHMARK	SC.912.N.1.3.	Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
BENCHMARK	SC.912.N.1.7.	Recognize the role of creativity in constructing scientific questions, methods and explanations.
BODY OF KNOWLEDGE	**FL.SC.912.N.**	**Nature of Science**
BIG IDEA	**SC.912.N.4.**	**Science and Society - As tomorrows citizens, students should be able to identify issues about which society could provide input, formulate scientifically investigable questions about those issues, construct investigations of their questions, collect and evaluate data from their investigations, and develop scientific recommendations based upon their findings.**
BENCHMARK	SC.912.N.4.2.	Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.
BODY OF KNOWLEDGE	**FL.SC.912.E.**	**Earth and Space Science**
BIG IDEA	**SC.912.E.6.**	**Earth Structures - The scientific theory of plate tectonics provides the framework for much of modern geology. Over geologic time, internal and external sources of energy have continuously altered the features of Earth by means of both constructive and destructive forces. All life, including human civilization, is dependent on Earth's internal and external energy and material resources.**
BENCHMARK	SC.912.E.6.6.	Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.
BODY OF KNOWLEDGE	**FL.SC.912.E.**	**Earth and Space Science**
BIG IDEA	**SC.912.E.7.**	**Earth Systems and Patterns - The scientific theory of the evolution of Earth states that changes in our planet are driven by the flow of energy and the cycling of matter through dynamic interactions among the atmosphere, hydrosphere, cryosphere, geosphere, and biosphere, and the resources used to sustain human civilization on Earth.**
BENCHMARK	SC.912.E.7.7.	Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.
BODY OF KNOWLEDGE	**FL.SC.912.P.**	**Physical Science**
BIG IDEA	**SC.912.P.10.**	**Energy - A. Energy is involved in all physical and chemical processes. It is conserved, and can be transformed from one form to another and into work. At the atomic and nuclear levels energy is not continuous but exists in discrete amounts. Energy and mass are related through Einstein's equation E=mc 2 . B. The properties of atomic nuclei are responsible for energy-related phenomena such as radioactivity, fission and fusion. C. Changes in entropy and energy that accompany chemical reactions influence reaction paths. Chemical reactions result in the release or absorption of energy. D. The theory of electromagnetism explains that electricity and magnetism are closely related. Electric charges are the source of electric fields. Moving charges generate magnetic fields. E. Waves are the propagation of a disturbance. They transport energy and momentum but do not transport matter.**
BENCHMARK	SC.912.P.10.16.	Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

BODY OF KNOWLEDGE	**FL.SC.912.L.**	**Life Science**
BIG IDEA	**SC.912.L.17.**	**Interdependence - A. The distribution and abundance of organisms is determined by the interactions between organisms, and between organisms and the non-living environment. B. Energy and nutrients move within and between biotic and abiotic components of ecosystems via physical, chemical and biological processes. C. Human activities and natural events can have profound effects on populations, biodiversity and ecosystem processes.**
BENCHMARK	SC.912.L.17.4.	Describe changes in ecosystems resulting from seasonal variations, climate change and succession.
BENCHMARK	SC.912.L.17.8.	Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
BENCHMARK	SC.912.L.17.15.	Discuss the effects of technology on environmental quality.
BENCHMARK	SC.912.L.17.16.	Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.
BENCHMARK	SC.912.L.17.20.	Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Florida Standards

Technology Education

Grade **11** - Adopted: **2016**

BODY OF KNOWLEDGE	**FL.SC.912.CS-CS.**	**COMPUTER SCIENCE - COMMUNICATION SYSTEMS AND COMPUTING**
BIG IDEA	**SC.912.CS-CS.2.**	**Problem solving and algorithms**
BENCHMARK	SC.912.CS-CS.2.5	Evaluate a classical algorithm and implement an original algorithm.
BENCHMARK	SC.912.CS-CS.2.7	Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.

BODY OF KNOWLEDGE	**FL.SC.912.CS-CP.**	**COMPUTER SCIENCE - COMPUTER PRACTICES AND PROGRAMMING**
BIG IDEA	**SC.912.CS-CP.1.**	**Data analysis**
BENCHMARK	SC.912.CS-CP.1.4	Collect real-time data from sources such as simulations, scientific and robotic sensors, and device emulators, using this data to formulate strategies or algorithms to solve advanced problems.

Georgia Standards of Excellence

Mathematics

Grade **11** - Adopted: **2021**

STRAND/TOPIC		**Algebra: Concepts & Connections**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**

ELEMENT	**A.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	A.MM.1.1.	Explain applicable, mathematical problems using a mathematical model.
STRAND/TOPIC		**Algebra: Concepts & Connections**
STANDARD / DESCRIPTION		**FUNCTIONAL & GRAPHICAL REASONING – function notation, modeling linear functions, linear vs. nonlinear comparisons**
ELEMENT	**A.FGR.2:**	**Construct and interpret arithmetic sequences as functions, algebraically and graphically, to model and explain real-life phenomena. Use formal notation to represent linear functions and the key characteristics of graphs of linear functions, and informally compare linear and non-linear functions using parent graphs.**
ELEMENT/GLE	A.FGR.2.2.	Construct and interpret the graph of a linear function that models real-life phenomena and represent key characteristics of the graph using formal notation.
STRAND/TOPIC		**Advanced Algebra (Algebra II): Concepts and Connections**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**AA.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	AA.MM.1.1.	Explain applicable, mathematical problems using a mathematical model.
ELEMENT/GLE	AA.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a mathematical, applicable situation.
STRAND/TOPIC		**Advanced Algebra (Algebra II): Concepts and Connections**
STANDARD / DESCRIPTION		**FUNCTIONAL & GRAPHICAL REASONING – exponential and logarithmic functions**
ELEMENT	**AA.FGR.3:**	**Explore and analyze structures and patterns for exponential and logarithmic functions and use exponential and logarithmic expressions, equations, and functions to model real-life phenomena.**
ELEMENT/GLE	AA.FGR.3.4.	Create exponential equations and use logarithms to solve mathematical, applicable problems for which only one variable is unknown.
STRAND/TOPIC		**Advanced Financial Algebra**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**AFA.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	AFA.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	AFA.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	AFA.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.

ELEMENT/GLE	AFA.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.

STRAND/TOPIC		**Advanced Financial Algebra**
STANDARD / DESCRIPTION		**FUNCTIONAL & GRAPHICAL REASONING – Linear, Exponential, Quadratic, Cubic, Rational, Square Root, Greatest Integer, and Piecewise Functions**
ELEMENT	**AFA.FGR.3:**	**Explore and apply functions to model and explain real-life phenomena and to solve complex problems in business and financial contexts.**
ELEMENT/GLE	AFA.FGR.3.5.	Create, apply, and interpret linear functions to model real-world financial problems.

STRAND/TOPIC		**Advanced Financial Algebra**
STANDARD / DESCRIPTION		**DATA & STATISTICAL REASONING – Data Displays**
ELEMENT	**AFA.DSR.7:**	**Collect, analyze, interpret, summarize, and construct displays of data to make predictions within real-world applications.**
ELEMENT/GLE	AFA.DSR.7.8.	Apply the Arithmetic Average Formula to calculate and interpret a d-day simple moving average given a set of n data points, p(1), p(2), p(3), ..., p(n-1), p(n).

STRAND/TOPIC		**Advanced Financial Algebra**
STANDARD / DESCRIPTION		**DATA & STATISTICAL REASONING – Investigative Research**
ELEMENT	**AFA.DSR.8:**	**Conduct investigative research to solve real-life problems and answer statistical questions involved in business and financial decision-making.**
ELEMENT/GLE	AFA.DSR.8.1.	Identify a contextual, real-life problem that can be answered using investigative research.

STRAND/TOPIC		**Linear Algebra with Computer Science Applications**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**LACS.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	LACS.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	LACS.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	LACS.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	LACS.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.

STRAND/TOPIC		**Geometry: Concepts & Connections**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**

ELEMENT	**G.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	G.MM.1.1.	Explain mathematically applicable problems using a mathematical model.
ELEMENT/GLE	G.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	G.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a mathematically applicable situation.
ELEMENT/GLE	G.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.
STRAND/TOPIC		**Advanced Finite Mathematics**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**AFM.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	AFM.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	AFM.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	AFM.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	AFM.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.
STRAND/TOPIC		**Advanced Mathematical Decision Making**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**AMDM.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	AMDM.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	AMDM.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	AMDM.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	AMDM.MM.1.4.	Use relevant information to create various mathematical representations and structures to solve real-life problems.
STRAND/TOPIC		**Advanced Mathematical Decision Making**
STANDARD / DESCRIPTION		**FUNCTIONAL & GRAPHICAL REASONING – Modeling with Functions**

ELEMENT	**AMDM.FGR.9:**	**Use functions to model problem situations in both discrete and continuous relationships.**
ELEMENT/GLE	AMDM.FGR.9.2.	Use linear, exponential, logistic, and piecewise functions to construct a model.
STRAND/TOPIC		**Precalculus**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**PC.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	PC.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	PC.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	PC.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	PC.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.
STRAND/TOPIC		**Calculus**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**C.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	C.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	C.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	C.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	C.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.
STRAND/TOPIC		**Multivariable Calculus**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**MVC.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	MVC.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	MVC.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.

ELEMENT/GLE	MVC.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	MVC.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.
STRAND/TOPIC		**Differential Equations**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**DE.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	DE.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	DE.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	DE.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	DE.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.
STRAND/TOPIC		**Engineering Calculus**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**EC.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	EC.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	EC.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	EC.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	EC.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.
STRAND/TOPIC		**Engineering Calculus**
STANDARD / DESCRIPTION		**ABSTRACT REASONING – Impact of Engineering in Mathematics**
ELEMENT	**EC.AR.2:**	**Using the engineering design process, apply mathematical concepts and procedures to solve problems in engineering contexts and research the impact of engineering and technological advancement on mathematics and society.**
ELEMENT/GLE		**Solve and explain engineering-based calculus problems; use mathematical and engineering models to explain real-life phenomena, using appropriate terminology and technology.**

EXPECTATION	EC.AR.2.3.	Apply and adapt a variety of appropriate strategies to solve problems.
EXPECTATION	EC.AR.2.4.	Use visual and written communication to organize, record, and articulate coherent, mathematical thinking and to express basic design elements.
EXPECTATION	EC.AR.2.5.	Monitor and reflect on the process of mathematical problem solving and interpret solutions that arise in engineering contexts.
EXPECTATION	EC.AR.2.6.	Produce multiple representations for mathematics presented in engineering contexts.
EXPECTATION	EC.AR.2.8.	Use mathematical representations to model and interpret physical and engineering phenomena.
STRAND/TOPIC		**College Readiness Mathematics**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**CRM.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	CRM.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	CRM.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	CRM.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	CRM.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.
STRAND/TOPIC		**Mathematics of Industry and Government**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**MIG.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	MIG.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	MIG.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	MIG.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	MIG.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.

STRAND/TOPIC		**Statistical Reasoning**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**SR.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	SR.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	SR.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or the humanities.
ELEMENT/GLE	SR.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a real-life situation.
ELEMENT/GLE	SR.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.

STRAND/TOPIC		**History of Mathematics**
STANDARD / DESCRIPTION		**MATHEMATICAL MODELING**
ELEMENT	**HM.MM.1:**	**Apply mathematics to real-life situations; model real-life phenomena using mathematics.**
ELEMENT/GLE	HM.MM.1.1.	Explain contextual, mathematical problems using a mathematical model.
ELEMENT/GLE	HM.MM.1.2.	Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts.
ELEMENT/GLE	HM.MM.1.3.	Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation.
ELEMENT/GLE	HM.MM.1.4.	Use various mathematical representations and structures with this information to represent and solve real-life problems.

STRAND/TOPIC		**History of Mathematics**
STANDARD / DESCRIPTION		**LOGICAL, MATHEMATICAL & INVESTIGATIVE REASONING – Ancient Greek Mathematics**
ELEMENT	**HM.LMIR.3:**	**Engage in the mathematical and cultural accomplishments of the ancient Greeks in order to grasp the foundational aspects of modern mathematics.**
ELEMENT/GLE		**Greek geometry**
EXPECTATION	HM.LMIR.3.1.	Prove statements in a deductive system by using its definitions, postulates, and axioms

Georgia Standards of Excellence

Science

Grade **11** - Adopted: **2016**

STRAND/TOPIC	**40.05100.**	**Chemistry**

STANDARD / DESCRIPTION	**SC3.**	**Obtain, evaluate, and communicate information about how the Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions.**
ELEMENT	SC3.a.	Use mathematics and computational thinking to balance chemical reactions (i.e., synthesis, decomposition, single replacement, double replacement, and combustion) and construct an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
ELEMENT	SC3.b.	Plan and carry out an investigation to determine that a new chemical has been formed by identifying indicators of a chemical reaction (e.g., precipitate formation, gas evolution, color change, water production, and changes in energy to the system).
STRAND/TOPIC	**40.06400.**	**Earth Systems**
STANDARD / DESCRIPTION	**SES5.**	**Obtain, evaluate, and communicate information to investigate the interaction of solar energy and Earth's systems to produce weather and climate.**
ELEMENT	SES5.f.	Construct an argument relating changes in global climate to variation to Earth/sun relationships and atmospheric composition.
STRAND/TOPIC	**40.06400.**	**Earth Systems**
STANDARD / DESCRIPTION	**SES6.**	**Obtain, evaluate, and communicate information about how life on Earth responds to and shapes Earth's systems.**
ELEMENT	SES6.d.	Analyze and interpret data that relates changes in global climate to natural and anthropogenic modification of Earth's atmosphere and oceans.
STRAND/TOPIC	**26.06110.**	**Environmental Science**
STANDARD / DESCRIPTION	**SEV2.**	**Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems.**
ELEMENT	SEV2.b.	Analyze and interpret data to determine how changes in atmospheric chemistry (carbon dioxide and methane) impact the greenhouse effect.
STRAND/TOPIC	**26.06110.**	**Environmental Science**
STANDARD / DESCRIPTION	**SEV3.**	**Obtain, evaluate, and communicate information to evaluate types, availability, allocation, and sustainability of energy resources.**
ELEMENT	SEV3.a.	Analyze and interpret data to communicate information on the origin and consumption of renewable forms of energy (wind, solar, geothermal, biofuel, and tidal) and non-renewable energy sources (fossil fuels and nuclear energy).
ELEMENT	SEV3.b.	Construct an argument based on data about the risks and benefits of renewable and nonrenewable energy sources.
ELEMENT	SEV3.c.	Obtain, evaluate, and communicate data to predict the sustainability potential of renewable and non-renewable energy resources.
ELEMENT	SEV3.d.	Design and defend a sustainable energy plan based on scientific principles for your location.
STRAND/TOPIC	**26.06110.**	**Environmental Science**
STANDARD / DESCRIPTION	**SEV4.**	**Obtain, evaluate, and communicate information to analyze human impact on natural resources.**

ELEMENT	SEV4.a.	Construct and revise a claim based on evidence on the effects of human activities on natural resources.
ELEMENT	SEV4.b.	Design, evaluate, and refine solutions to reduce human impact on the environment including, but not limited to, smog, ozone depletion, urbanization, and ocean acidification.
STRAND/TOPIC	**26.06110.**	**Environmental Science**
STANDARD / DESCRIPTION	**SEV5.**	**Obtain, evaluate, and communicate information about the effects of human population growth on global ecosystems.**
ELEMENT	SEV5.c.	Construct an argument from evidence regarding the ecological effects of human innovations (Agricultural, Industrial, Medical, and Technological Revolutions) on global ecosystems.
ELEMENT	SEV5.d.	Design and defend a sustainability plan to reduce your individual contribution to environmental impacts, taking into account how market forces and societal demands (including political, legal, social, and economic) influence personal choices.
STRAND/TOPIC	**40.01100.**	**Physical Science**
STANDARD / DESCRIPTION	**SPS10.**	**Obtain, evaluate, and communicate information to explain the properties of and relationships between electricity and magnetism.**
ELEMENT	SPS10.c.	Plan and carry out investigations to determine the relationship between magnetism and the movement of electrical charge.

Grade **11** - Adopted: **2019**

STRAND/TOPIC	**26.06100.**	**Ecology (2019)**
STANDARD / DESCRIPTION	**SEC5.**	**Obtain, evaluate, and communicate information on the impact of natural and anthropogenic activities on ecological systems.**
ELEMENT	SEC5.b.	Construct an argument based on evidence to predict the impact of climate change on an ecosystem.
STRAND/TOPIC	**40.04100.**	**Meteorology (2019)**
STANDARD / DESCRIPTION	**SM2.**	**Obtain, evaluate, and communicate information about energy transfer and its role in precipitation, cloud formation, and air mass formation.**
ELEMENT	SM2.d.	Develop and use models to construct an explanation of the role that pressure differences have on energy transfer and the development of wind systems (e.g., sea breeze, land breeze, Hadley cells, Ferrel cells, prevailing winds, jet stream, ENSO, global scale winds).
STRAND/TOPIC	**40.04100.**	**Meteorology (2019)**
STANDARD / DESCRIPTION	**SM5.**	**Obtain, evaluate, and communicate information about climate and climate change.**
ELEMENT	SM5.b.	Ask questions and communicate information about factors impacting global climate change (e.g., Milankovitch and ENSO cycles, greenhouse gases, changes in physical geography).
STRAND/TOPIC	**26.07100.**	**Zoology (2019)**
STANDARD / DESCRIPTION	**SZ5.**	**Obtain, evaluate, and communicate information to analyze the relationship between humans and animals within various phyla.**

ELEMENT	SZ5.a.	Ask questions and define problems identifying the cause and effect of human activities on the biodiversity of organisms (including habitat destruction, overharvesting, water consumption, and pollution).
ELEMENT	SZ5.c.	Construct an argument based on evidence of the short-term and long-term impacts of legal, societal, political, ethical, and economic decisions on animal diversity.

Georgia Standards of Excellence

Technology Education

Grade **11** - Adopted: **2013**

STRAND/TOPIC		**Information Technology Career Cluster - Introduction to Digital Technology (Course Number 11.41500)**
STANDARD / DESCRIPTION	**IT-IDT-1.**	**Demonstrate employability skills required by business and industry.**
ELEMENT	IT-IDT-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
STRAND/TOPIC		**Information Technology Career Cluster - Introduction to Cybersecurity (Course Number: 11.48100)**
STANDARD / DESCRIPTION	**IT-ICS-1.**	**Demonstrate employability skills required by business and industry.**
ELEMENT	IT-ICS-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
STRAND/TOPIC		**Information Technology Career Cluster - Advanced Cybersecurity (Course Number: 11.48200)**
STANDARD / DESCRIPTION	**IT-ACS-1.**	**Demonstrate employability skills required by business and industry.**
ELEMENT	IT-ACS-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
STRAND/TOPIC		**Information Technology Career Cluster - Computer Science Principles (Course Number: 11.47100)**
STANDARD / DESCRIPTION	**IT-CSP-1.**	**Demonstrate employability skills required by business and industry.**
ELEMENT	IT-CSP-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
STRAND/TOPIC		**Information Technology Career Cluster - Computer Science Principles (Course Number: 11.47100)**
STANDARD / DESCRIPTION	**IT-CSP-5.**	**Develop, express, implement, and analyze algorithms analytically and empirically.**
ELEMENT	IT-CSP-5.1.	Develop an algorithm designed to be implemented to run on a computer.
ELEMENT	IT-CSP-5.2.	Explain the building blocks of algorithms: sequencing, selection, iteration, and recursion.
ELEMENT	IT-CSP-5.3.	Express an algorithm in a language.
ELEMENT	IT-CSP-5.5.	Connect problems to potential algorithmic solutions and explain an example of problems that cannot be solved using algorithms.

STRAND/TOPIC		Information Technology Career Cluster - Computer Science Principles (Course Number: 11.47100)
STANDARD / DESCRIPTION	IT-CSP-6.	Create programs that translate human intention into computational artifacts including music, images, visualizations, and more while exploring the concepts, techniques and development used in writing programs.
ELEMENT	IT-CSP-6.1.	Explain how programs implement algorithms.

STRAND/TOPIC		Information Technology Career Cluster - Game Design: Animation and Simulation Course Number: 11.42900
STANDARD / DESCRIPTION	IT-GDAS-1.	Demonstrate employability skills required by business and industry.
ELEMENT	IT-GDAS-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

STRAND/TOPIC		Information Technology Career Cluster - Embedded Computing (Course Number: 11.42700)
STANDARD / DESCRIPTION	IT-EP-1.	Demonstrate employability skills required by business and industry.
ELEMENT	IT-EP-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

STRAND/TOPIC		Information Technology Career Cluster - Embedded Computing (Course Number: 11.42700)
STANDARD / DESCRIPTION	IT-EP-10.	Design an embedded computing application that solves a current problem (e.g., robotics, artbotics, visual, and kinetic art).
ELEMENT	IT-EP-10.1.	Design, develop, and debug an embedded computing application interfacing to an external sensor, switch, LED, or other device.

STRAND/TOPIC		Information Technology Career Cluster - Programming, Games, Apps, and Society (Course Number: 11.47200)
STANDARD / DESCRIPTION	IT-PGAS-1.	Demonstrate employability skills required by business and industry.
ELEMENT	IT-PGAS-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

STRAND/TOPIC		Information Technology Career Cluster - Web Development (Course Number: 11.42500)
STANDARD / DESCRIPTION	IT-WDEV-1.	Demonstrate employability skills required by business and industry.
ELEMENT	IT-WDEV-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

STRAND/TOPIC		Information Technology Career Cluster - Information Technology Essentials (Course Number: 11.41400)
STANDARD / DESCRIPTION	IT-ITE-1.	Demonstrate employability skills required by business and industry.

ELEMENT	IT-ITE-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
STRAND/TOPIC		**Information Technology Career Cluster - Information Technology Support (Course Number: 11.42000)**
STANDARD / DESCRIPTION	**IT-ITS-1.**	**Demonstrate employability skills required by business and industry.**
ELEMENT	IT-ITS-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
STRAND/TOPIC		**Information Technology Career Cluster - Networking Fundamentals (Course Number: 11.46100)**
STANDARD / DESCRIPTION	**IT-NF-1.**	**Demonstrate employability skills required by business and industry.**
ELEMENT	IT-NF-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
STRAND/TOPIC		**Information Technology Career Cluster - Networking Systems and Support (Course Number: 11.46200)**
STANDARD / DESCRIPTION	**IT-NSS-1.**	**Demonstrate employability skills required by business and industry.**
ELEMENT	IT-NSS-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
STRAND/TOPIC		**Information Technology Career Cluster - Web Design (Course Number: 11.45200)**
STANDARD / DESCRIPTION	**IT-WD-1.**	**Demonstrate employability skills required by business and industry.**
ELEMENT	IT-WD-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.
STRAND/TOPIC		**Information Technology Career Cluster - Digital Design (Course Number 11.45100)**
STANDARD / DESCRIPTION	**IT-DD-1.**	**Demonstrate employability skills required by business and industry.**
ELEMENT	IT-DD-1.3.	Exhibit critical thinking and problem solving skills to locate, analyze and apply information in career planning and employment situations.

Hawaii Content and Performance Standards

Mathematics

Grade **11** - Adopted: **2010 (CCSS)**

CONTENT STANDARD / COURSE	**HI.CC.MP.**	**Mathematical Practices**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	MP-1.	Make sense of problems and persevere in solving them.

STANDARD / PERFORMANCE INDICATOR / DOMAIN	MP-2.	Reason abstractly and quantitatively.
STANDARD / PERFORMANCE INDICATOR / DOMAIN	MP-3.	Construct viable arguments and critique the reasoning of others.
STANDARD / PERFORMANCE INDICATOR / DOMAIN	MP-4.	Model with mathematics.
STANDARD / PERFORMANCE INDICATOR / DOMAIN	MP-8.	Look for and express regularity in repeated reasoning.

CONTENT STANDARD / COURSE	**HI.CC.A.**	**Algebra**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**A-CED.**	**Creating Equations**
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Create equations that describe numbers or relationships.**
EXPECTATION / TOPIC	A-CED.2.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

CONTENT STANDARD / COURSE	**HI.CC.A.**	**Algebra**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**A-REI.**	**Reasoning with Equations and Inequalities**
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Understand solving equations as a process of reasoning and explain the reasoning.**
EXPECTATION / TOPIC	A-REI.1.	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

CONTENT STANDARD / COURSE	**HI.CC.F.**	**Functions**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**F-IF.**	**Interpreting Functions**

INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Analyze functions using different representations.**
EXPECTATION / TOPIC	**F-IF.7.**	**Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.**
PERFORMANCE INDICATOR	F-IF.7(a)	Graph linear and quadratic functions and show intercepts, maxima, and minima.

CONTENT STANDARD / COURSE	**HI.CC.F.**	**Functions**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**F-LE.**	**Linear and Exponential Models**
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Construct and compare linear and exponential models and solve problems.**
EXPECTATION / TOPIC	**F-LE.1.**	**Distinguish between situations that can be modeled with linear functions and with exponential functions.**
PERFORMANCE INDICATOR	F-LE.1(a)	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

CONTENT STANDARD / COURSE	**HI.CC.G.**	**Geometry**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**G-GPE.**	**Expressing Geometric Properties with Equations**
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Use coordinates to prove simple geometric theorems algebraically**
EXPECTATION / TOPIC	G-GPE.5.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Hawaii Content and Performance Standards

Science

Grade **11** - Adopted: **2016**

CONTENT STANDARD / COURSE	**NGSS.HS-PS.**	**PHYSICAL SCIENCE**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**HS-PS1.**	**Matter and Its Interactions**
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Students who demonstrate understanding can:**
EXPECTATION / TOPIC	HS-PS1-4.	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

CONTENT STANDARD / COURSE	**NGSS.HS-PS.**	**PHYSICAL SCIENCE**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**HS-PS3.**	**Energy**
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Students who demonstrate understanding can:**
EXPECTATION / TOPIC	HS-PS3-3.	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

CONTENT STANDARD / COURSE	**NGSS.HS-PS.**	**PHYSICAL SCIENCE**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**HS-PS4.**	**Waves and Their Applications in Technologies for Information Transfer**
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Students who demonstrate understanding can:**
EXPECTATION / TOPIC	HS-PS4-2.	Evaluate questions about the advantages of using a digital transmission and storage of information.

CONTENT STANDARD / COURSE	**NGSS.HS-LS.**	**LIFE SCIENCE**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**HS-LS2.**	**Ecosystems: Interactions, Energy, and Dynamics**
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Students who demonstrate understanding can:**
EXPECTATION / TOPIC	HS-LS2-7.	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

CONTENT STANDARD / COURSE	**NGSS.HS-ESS.**	**EARTH AND SPACE SCIENCE**
STANDARD / PERFORMANCE INDICATOR / DOMAIN	**HS-ESS2.**	**Earth's Systems**
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		**Students who demonstrate understanding can:**
EXPECTATION / TOPIC	HS-ESS2-4.	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

CONTENT STANDARD / COURSE	NGSS.HS-ESS.	EARTH AND SPACE SCIENCE
STANDARD / PERFORMANCE INDICATOR / DOMAIN	HS-ESS3.	Earth and Human Activity
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		Students who demonstrate understanding can:
EXPECTATION / TOPIC	HS-ESS3-1.	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
EXPECTATION / TOPIC	HS-ESS3-2.	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
EXPECTATION / TOPIC	HS-ESS3-3.	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
EXPECTATION / TOPIC	HS-ESS3-4.	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
EXPECTATION / TOPIC	HS-ESS3-6.	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

CONTENT STANDARD / COURSE	NGSS.HS-ETS.	ENGINEERING DESIGN
STANDARD / PERFORMANCE INDICATOR / DOMAIN	HS-ETS1.	Engineering Design
INDICATOR / GRADE LEVEL EXPECTATION / BENCHMARK		Students who demonstrate understanding can:
EXPECTATION / TOPIC	HS-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
EXPECTATION / TOPIC	HS-ETS1-2.	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
EXPECTATION / TOPIC	HS-ETS1-3.	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.