Starting with Workforce Skills

Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
Core Values Lesson 1 - Explore *FIRST* Core Values and their relationship to developing teamwork. - Understand the importance of *Gracious Professionalism®* and *Coopertition®*. - Develop a team identity and use it for communicating expectations as a team using *FIRST* Core Values and *Gracious Professionalism*. - Utilize *Engineering Notebook* templates to improve written communication as a team while practicing discovery and innovation.	**(SEL) Skills and the Mathematical Processes**	3. To the best of their ability, students will learn to develop self-awareness and sense of identity as they apply *problem solving* skills to work through challenging math problems, understanding that their resourcefulness in using various strategies to respond to stress is helping them build personal resilience	x
	Spatial Sense	**E1.2** make objects and models using appropriate scales, given their top, front, and side views or their perspective views **E1.3** use scale drawings to calculate actual lengths and areas, and reproduce scale drawings at different ratios	X
	Financial Literacy	**F1.3** identify different ways to maintain a balanced budget, and use appropriate tools to track all income and spending, for several different scenarios	-
Project Management Lesson 2 - Explore how to make what you learn more impactful. -Understand the tools available for project management. - Turn expectations into the goals you would like to accomplish. -Determine the tools and methods your team will use to manage a project. - Develop a safety plan for your team.	**(SEL) Skills and the Mathematical Processes**	2. To the best of their ability, students will learn to recognize sources of stress and cope with challenges as they make connections among mathematical concepts, procedures, and representations, and relate mathematical ideas to other contexts (e.g., other curriculum areas, daily life, sports) so they can see themselves as capable math learners, and strengthen their sense of ownership of their learning, as part of their emerging sense of identity and belonging	X
	Financial Literacy	**F1.3** identify different ways to maintain a balanced budget, and use appropriate tools to track all income and spending, for several different scenarios	X
Problem Solving Skills Lesson 3 - Discover the engineering design process and tools for computational thinking. -Understand how computational thinking tools can help you improve the engineering design process. - Turn expectations into the goals you would like to accomplish. - Use engineering design and computational thinking to solve a design problem. -Use computational thinking in the testing process to improve iterations in the design cycle.	**(SEL) Skills and the Mathematical Processes**	2. To the best of their ability, students will learn to recognize sources of stress and cope with challenges as they apply skills to develop, select, and apply problem-solving strategies so they can recognize that testing out different approaches to problems and learning from mistakes is an important part of the learning process, and is aided by a sense of optimism and hope.	X
	Spatial Sense	**E1.2** make objects and models using appropriate scales, given their top, front, and side views or their perspective views **E2.3** solve problems involving the perimeter, circumference, area, volume, and surface area of composite two-dimensional shapes and three-dimensional objects, using appropriate formulas **E2.4** describe the Pythagorean relationship using various geometric models, and apply the theorem to solve problems involving an unknown side length for a given right triangle	X X -

Building and Programming A Basic Robot			
Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
Inside a Robot Lesson 1 - Discover what robot is and how are they used in industry. - Discover the parts of a *FIRST* Tech Challenge robot and how its technology is transferrable to the workforce. - Decompose a robot into how it can plan, sense, and act and the relationship of its systems and distinctions that allow it to achieve a task. - Develop design criteria for your robot using the Engineering Design Process.	**(SEL) Skills and the Mathematical Processes**	6. To the best of their ability, students will learn to think critically and creatively as they apply the skills to make connections among mathematical concepts, procedures, and representations, and relate mathematical ideas to other contexts (e.g., other curriculum areas, daily life, sports) make connections between math and everyday contexts to help them make informed judgements and decisions	X
	Algebra	C1.1 Patterns- identify and compare a variety of repeating, growing, and shrinking patterns, including patterns found in real-life contexts, and compare linear growing and shrinking patterns on the basis of their constant rates and initial values	-
		C4. Mathmatical Modeling- apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations	-
	Data	D2.1 Probability solve various problems that involve probability, using appropriate tools and strategies, including Venn and tree diagrams	-
	Spatial Sense	**E1.2** make objects and models using appropriate scales, given their top, front, and side views or their perspective views **E2.3** solve problems involving the perimeter, circumference, area, volume, and surface area of composite two-dimensional shapes and three-dimensional objects, using appropriate formulas	-
Chassis and Drive System Lesson 2 - Discover different types of chassis configurations and how they achieve different functions. - Discover principles of speed, torque, the center of gravity, and structural integrity. - Experiment with principles of chassis speed, torque, and center of gravity using the robot physics lab. - Use understanding the problem, brainstorming, and decision-making to determine a chassis design. - Build a robot chassis that best meets your design criteria. *The math standards may not be directly taught in the lesson, but are applied in the physics lab. The physics lab is a simulation tool embedded in the content, where students can test variables, visually see the results of changing variables, and use mathematical*	**(SEL) Skills and the Mathematical Processes**	6. To the best of their ability, students will learn to think critically and creatively as they apply the skills to make connections among mathematical concepts, procedures, and representations, and relate mathematical ideas to other contexts (e.g., other curriculum areas, daily life, sports) make connections between math and everyday contexts to help them make informed judgements and decisions	X
	Number	B1.1 represent and compare very large and very small numbers, including through the use of scientific notation, and describe various ways they are used in everyday life B1.2 describe, compare, and order numbers in the real number system (rational and irrational numbers), separately and in combination, in various contexts B1.4 use fractions, decimal numbers, and percents, including percents of more than 100% or less than 1%, interchangeably and flexibly to solve a variety of problems B2.1 use the properties and order of operations, and the relationships between operations, to solve problems involving rational numbers, ratios, rates, and percents, including those requiring multiple steps or multiple operations B2.3 use mental math strategies to multiply and divide whole numbers and decimal numbers up to thousandths by powers of ten, and explain the strategies used B2. 4 add and subtract integers, using appropriate strategies, in various contexts B2.6 multiply and divide fractions by fractions, as well as by whole numbers and mixed numbers, in various contexts B2.7 multiply and divide integers, using appropriate strategies, in various contexts	x - x x

equations to understand the physics and mathematical calculations involved in the physics behind the design. *Individual mathematical principles can be reinforced and taught using the physics documents for each physics lab.* *Robot Speed, Acceleration and Center of Gravity Lab Physics.* *The teacher guide contains sample experiments and results.* *Application of creating graphs and tables, and mathematical concepts should be created as an expectation in the Engineering Notebook students create as part of the documentation of their learning.*		B2.8 compare proportional situations and determine unknown values in proportional situations, and apply proportional reasoning to solve problems in various contexts	x
	Algebra	C1.1 identify, describe, extend, create, and make predictions about a variety of patterns, including those found in real-life contexts C1.2 create and translate repeating, growing, and shrinking patterns involving rational numbers using various representations, including algebraic expressions and equations for linear growing and shrinking patterns C1.3 determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in growing and shrinking patterns involving rational numbers, and use algebraic representations of the pattern rules to solve for unknown values in linear growing and shrinking patterns C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions C2.4 solve inequalities that involve integers, and verify and graph the solutions C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions C4. apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations	X - - - - -
	Data	D1.1 identify situations involving one-variable data and situations involving two-variable data, and explain when each type of data is needed D1.2 collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values D1.3 select from among a variety of graphs, including scatter plots, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data D1.5 use mathematical language, including the terms “strong”, “weak”, “none”, “positive”, and “negative”, to describe the relationship between two variables for various data sets with and without outliers D1.6 analyse different sets of data presented in various ways, including in scatter plots and in misleading graphs, by asking and answering questions about the data, challenging preconceived notions, and drawing conclusions, then make convincing arguments and informed decisions D2.2 determine and compare the theoretical and experimental probabilities of multiple independent events happening and of multiple dependent events happening	X X X X X X x
	Spatial Sense	E1.2 make objects and models using appropriate scales, given their top, front, and side views or their perspective views	X X

		E1.3 use scale drawings to calculate actual lengths and areas, and reproduce scale drawings at different ratios E1.4 describe and perform translations, reflections, rotations, and dilations on a Cartesian plane, and predict the results of these transformations E2.2 solve problems involving angle properties, including the properties of intersecting and parallel lines and of polygons E2.3 solve problems involving the perimeter, circumference, area, volume, and surface area of composite two-dimensional shapes and three-dimensional objects, using appropriate formulas E2.4 describe the Pythagorean relationship using various geometric models, and apply the theorem to solve problems involving an unknown side length for a given right triangle	X X X X
Electrical Wiring and Configuration Lesson 3 - Explore basic electrical theory and its importance in wiring the robot. - Decompose the robot hardware and its importance in robot communication. - Wire a robot using a wiring diagram and preventative measures to limit electrostatic discharge on the robot. - Establish wireless communication pathways between the robot and the robot controller. - Configure the hardware according to the electrical diagram using consistent naming conventions. - Use a given template in the IDE to test configuration and wiring.	**(SEL) Skills and the Mathematical Processes**	6. To the best of their ability, students will learn to think critically and creatively as they apply the skills to make connections among mathematical concepts, procedures, and representations, and relate mathematical ideas to other contexts (e.g., other curriculum areas, daily life, sports) make connections between math and everyday contexts to help them make informed judgements and decisions	X
	Number	B1.2 describe, compare, and order numbers in the real number system (rational and irrational numbers) separately and in combination with various contexts. B1.4 use fractions, decimal numbers, and precents, including precents of more than 100% or less than 1% , interchangeably and flexibly to solve a variety of problems.	X x
	Data	**D1.2** collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data	X x
Programming Lesson 4 - Apply computational thinking to plan algorithms using pseudocode and flow charts. -Develop algorithms to control motors, servos, and sensors with increased program flow. -Learn how abstraction occurs in programming tools and how it can help you troubleshoot and understand problems. - Use programming templates to program your robot in Driver Controlled Mode. - Develop a basic algorithm for autonomous programming: drive and park. *-Specific number relationships should be connected when discussing joystick values*	(SEL) Skills and the Mathematical Processes	6. To the best of their ability, students will learn to think critically and creatively as they apply the skills to make connections among mathematical concepts, procedures, and representations, and relate mathematical ideas to other contexts (e.g., other curriculum areas, daily life, sports) make connections between math and everyday contexts to help them make informed judgements and decisions	X
	Number	B1.2 describe, compare, and order numbers in the real number system (rational and irrational numbers) separately and in combination with various contexts. B1.4 use fractions, decimal numbers, and precents, including precents of more than 100% or less than 1% , interchangeably and flexibly to solve a variety of problems.	X X

and needed values for motor power and how the numbers vary along the axis.			
	Algebra	C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code	X x
	Data	D1.2 collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data	X X
Manipulators Lesson 5 - Explore what a manipulator is. - Understand how to choose an actuator. - Choose an actuator to complete a task. - Use a gear ratio to affect torque and speed to achieve a task. - Utilize Engineering Notebook Templates to improve written communication as a team. *Instruction of the math standards may not be directly covered in the lesson but are applied in the physics lab. The physics lab is a simulation tool embedded in the content, where students can test variables, visually see the results of changing variables, and use mathematical equations to understand the physics and mathematical calculations involved in the physics behind the design.* *Individual mathematical principles can be reinforced and taught using the physics documents for each physics lab.* *Instruction of the math standards may not be directly covered in the lesson but are applied in the physics lab.* *Robot Manipulator Physics*	(SEL) Skills and the Mathematical Processes	6. To the best of their ability, students will learn to think critically and creatively as they apply the skills to make connections among mathematical concepts, procedures, and representations, and relate mathematical ideas to other contexts (e.g., other curriculum areas, daily life, sports) make connections between math and everyday contexts to help them make informed judgements and decisions	x
	Number	B1.1 represent and compare very large and very small numbers, including through the use of scientific notation, and describe various ways they are used in everyday life B1.2 describe, compare, and order numbers in the real number system (rational and irrational numbers), separately and in combination, in various contexts B1.4 use fractions, decimal numbers, and percents, including percents of more than 100% or less than 1%, interchangeably and flexibly to solve a variety of problems B2.1 use the properties and order of operations, and the relationships between operations, to solve problems involving rational numbers, ratios, rates, and percents, including those requiring multiple steps or multiple operations B2.3 use mental math strategies to multiply and divide whole numbers and decimal numbers up to thousandths by powers of ten, and explain the strategies used B2. 4 add and subtract integers, using appropriate strategies, in various contexts B2.6 multiply and divide fractions by fractions, as well as by whole numbers and mixed numbers, in various contexts B2.7 multiply and divide integers, using appropriate strategies, in various contexts B2.8 compare proportional situations and determine unknown values in proportional situations, and apply proportional reasoning to solve problems in various contexts	x x - x - x - - x
	Algebra	C1.1 identify, describe, extend, create, and make predictions about a variety of patterns, including those found in real-life contexts C1.2 create and translate repeating, growing, and shrinking patterns involving rational numbers using various representations, including algebraic expressions and equations for linear growing and shrinking patterns	X X

The teacher guide contains sample experiments and results. *Application of creating graphs and tables, and mathematical concepts should be focused as an expectation in the Engineering Notebook.*		C1.3 determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in growing and shrinking patterns involving rational numbers, and use algebraic representations of the pattern rules to solve for unknown values in linear growing and shrinking patterns	X
		C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions	-
		C2.4 solve inequalities that involve integers, and verify and graph the solutions	X
		C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions	X
		C4. apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations	X
	Data	D1.1 identify situations involving one-variable data and situations involving two-variable data, and explain when each type of data is needed	X
		D1.2 collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values	X
		D1.3 select from among a variety of graphs, including scatter plots, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs	X
		D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data	X
		D1.5 use mathematical language, including the terms “strong”, “weak”, “none”, “positive”, and “negative”, to describe the relationship between two variables for various data sets with and without outliers	X
		D1.6 analyse different sets of data presented in various ways, including in scatter plots and in misleading graphs, by asking and answering questions about the data, challenging preconceived notions, and drawing conclusions, then make convincing arguments and informed decisions	x
		D2.2 determine and compare the theoretical and experimental process	x
	Spatial Sense	E1.2 make objects and models using appropriate scales, given their top, front, and side views or their perspective views	X
		E1.3 use scale drawings to calculate actual lengths and areas, and reproduce scale drawings at different ratios	X
		E1.4 describe and perform translations, reflections, rotations, and dilations on a Cartesian plane, and predict the results of these transformations	-
		E2.2 solve problems involving angle properties, including the properties of intersecting and parallel lines and of polygons	-
		E2.3 solve problems involving the perimeter, circumference, area, volume, and surface area of composite two-dimensional shapes and three-dimensional objects, using appropriate formulas	-

		E2.4 describe the Pythagorean relationship using various geometric models, and apply the theorem to solve problems involving an unknown side length for a given right triangle	x

Designing for the Game			
Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
Game Plan Lesson 1 -Explore the components of a FIRST® Tech Challenge Game. - Understand where to find details that are abstracted in the Game Rules. - Explore details of the game using measurements and algorithms. - Brainstorm ideas for competing in the game. - Use a decision matrix to determine a game plan	(SEL) Skills and the Mathematical Processes	A.2 To the best of their ability, students will learn to recognize sources of stress and cope with challenges as they a develop and apply reasoning skills (e.g., classification, recognition of relationships, use of counter-examples) to justify thinking, make and investigate conjectures, and construct and defend arguments so they can recognize that testing out different approaches to problems and learning from mistakes is an important part of the learning process, and is aided by a sense of optimism and hope	X
	Number	**B1.2** describe, compare, and order numbers in the real number system (rational and irrational numbers), separately and in combination, in various contexts B1.4 use fractions, decimal numbers, and percents, including percents of more than 100% or less than 1%, interchangeably and flexibly to solve a variety of problems	X x
	Algebra	C1.1 identify and compare a variety of repeating, growing, and shrinking patterns, including patterns found in real-life contexts, and compare linear growing and shrinking patterns on the basis of their constant rates and initial values C1.3 determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in growing and shrinking patterns involving rational numbers, and use algebraic representations of the pattern rules to solve for unknown values in linear growing and shrinking patterns C2.2 evaluate algebraic expressions that involve rational numbers C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions	X X x x
	Spatial Sense	E1.1 identify geometric properties of tessellating shapes and identify the transformations that occur in the tessellations	X

Robot Plan Lesson 2 - Brainstorm ideas to achieve the robot actions determined in your game strategy. - Research ideas to understand processes others have used to achieve similar strategies. -Use the physics lab to test out ideas to achieve the game strategy. - Develop prototypes from the ideas. -Test prototypes to gain an understanding of system development that will be needed to achieve the game strategy *Instruction of the math standards may not be directly covered in the lesson but are applied in the physics lab. The physics lab is a simulation tool embedded in the content, where students can test variables, visually see the results of changing variables, and use mathematical equations to understand the physics and mathematical calculations involved in the physics behind the design.* *Individual mathematical principles can be reinforced and taught using the physics documents for each physics lab.* *Robot Manipulator Physics* *Robot Speed, Acceleration and Center of Gravity Lab Physics* *The teacher guide contains sample experiments and results.* *Application of creating graphs and tables, and mathematical concepts should be created as an expectation in the Engineering Notebook*	(SEL) Skills and the Mathematical Processes	6. To the best of their ability, students will learn to think critically and creatively as they select and use a variety of concrete, visual, and electronic learning tools and appropriate strategies to investigate mathematical ideas and to solve problems so they can recognize that testing out different approaches to problems and learning from mistakes is an important part of the learning process, and is aided by a sense of optimism and hope.	X
	Number	B1.1 represent and compare very large and very small numbers, including through the use of scientific notation, and describe various ways they are used in everyday life B1.2 describe, compare, and order numbers in the real number system (rational and irrational numbers), separately and in combination, in various contexts B1.4 use fractions, decimal numbers, and percents, including percents of more than 100% or less than 1%, interchangeably and flexibly to solve a variety of problems B2.1 use the properties and order of operations, and the relationships between operations, to solve problems involving rational numbers, ratios, rates, and percents, including those requiring multiple steps or multiple operations B2.3 use mental math strategies to multiply and divide whole numbers and decimal numbers up to thousandths by powers of ten, and explain the strategies used B2. 4 add and subtract integers, using appropriate strategies, in various contexts B2.6 multiply and divide fractions by fractions, as well as by whole numbers and mixed numbers, in various contexts B2.7 multiply and divide integers, using appropriate strategies, in various contexts B2.8 compare proportional situations and determine unknown values in proportional situations, and apply proportional reasoning to solve problems in various contexts	X - - - - - - - -
	Algebra	C1.1 identify, describe, extend, create, and make predictions about a variety of patterns, including those found in real-life contexts C1.2 create and translate repeating, growing, and shrinking patterns involving rational numbers using various representations, including algebraic expressions and equations for linear growing and shrinking patterns C1.3 determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in growing and shrinking patterns involving rational numbers, and use algebraic representations of the pattern rules to solve for unknown values in linear growing and shrinking patterns C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions C2.4 solve inequalities that involve integers, and verify and graph the solutions C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions C4. apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations	X - - - - - - -

students create as part of the documentation of their learning.	Data	D1.1 identify situations involving one-variable data and situations involving two-variable data, and explain when each type of data is needed D1.2 collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values D1.3 select from among a variety of graphs, including scatter plots, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data D1.5 use mathematical language, including the terms “strong”, “weak”, “none”, “positive”, and “negative”, to describe the relationship between two variables for various data sets with and without outliers D1.6 analyse different sets of data presented in various ways, including in scatter plots and in misleading graphs, by asking and answering questions about the data, challenging preconceived notions, and drawing conclusions, then make convincing arguments and informed decisions D2.2 determine and compare the theoretical and experimental process	X - - - - -
	Spatial Sense	E1.2 make objects and models using appropriate scales, given their top, front, and side views or their perspective views E1.3 use scale drawings to calculate actual lengths and areas, and reproduce scale drawings at different ratios E1.4 describe and perform translations, reflections, rotations, and dilations on a Cartesian plane, and predict the results of these transformations E2.2 solve problems involving angle properties, including the properties of intersecting and parallel lines and of polygons E2.3 solve problems involving the perimeter, circumference, area, volume, and surface area of composite two-dimensional shapes and three-dimensional objects, using appropriate formulas E2.4 describe the Pythagorean relationship using various geometric models, and apply the theorem to solve problems involving an unknown side length for a given right triangle	X - - - - -
Game Challenges		*- These are specific to other expectations covered in other lessons.*	

Machines and Mechanisms

Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
The math standards for this module are the same in each lessons with different applications depending on design choices. *Instruction of the math standards may not be directly covered in the lesson but are applied in the physics lab. The physics lab is a simulation tool embedded in the content, where students can test variables, visually see the results of changing variables, and use mathematical equations to understand the physics and mathematical calculations involved in the physics behind the design.* *Individual mathematical principles can be reinforced and taught using the physics documents for each physics lab. Links for Physics Labs: Robot Manipulator Physics Robot Speed Lab Physics, Gripper Lab Physics, Shooter Lab Physics. The teacher guide contains sample experiments and results.*			
Simple Machines Lesson 1 - Explore simple and compound machines and how they are used in robot manipulators. - Understand how forces transfer to motion and increase machine efficiency. - Consider the scalar and vector forces that affect how manipulators accomplish work. - Design a manipulator, and analyze the forces involved. Include essential calculations of the manipulator to achieve the desired output. **Levers, Cams and Linkages Lesson 2** - Explore ways you can transform motion and develop mechanisms with linkages and cams. - Understand degrees of freedom and geometry when designing mechanisms that involve linkages. -Discover linkages from history and how they are used to transform motion. - Analyze your team game strategy and robot and determine if linkages and cams can increase the efficiency of your robot. - Prototype linkages and cams that could help you achieve your game strategy. **Conveyance, Intakes, and Object Trajectory Lesson 3**	(SEL) Skills and the Mathematical Processes	4. To the best of their ability, students will learn to build relationships and communicate effectively make connections among mathematical concepts, procedures, and representations, and relate mathematical ideas to other contexts (e.g., other curriculum areas, daily life, sports) so they can make connections between math and everyday contexts to help them make informed judgements and decisions.	X
	Number	B1.1 represent and compare very large and very small numbers, including through the use of scientific notation, and describe various ways they are used in everyday life B1.2 describe, compare, and order numbers in the real number system (rational and irrational numbers), separately and in combination, in various contexts B1.4 use fractions, decimal numbers, and percents, including percents of more than 100% or less than 1%, interchangeably and flexibly to solve a variety of problems B2.1 use the properties and order of operations, and the relationships between operations, to solve problems involving rational numbers, ratios, rates, and percents, including those requiring multiple steps or multiple operations B2.3 use mental math strategies to multiply and divide whole numbers and decimal numbers up to thousandths by powers of ten, and explain the strategies used B2. 4 add and subtract integers, using appropriate strategies, in various contexts B2.6 multiply and divide fractions by fractions, as well as by whole numbers and mixed numbers, in various contexts B2.7 multiply and divide integers, using appropriate strategies, in various contexts B2.8 compare proportional situations and determine unknown values in proportional situations, and apply proportional reasoning to solve problems in various contexts	X - - - - - - - -
	Algebra	C1.1 identify, describe, extend, create, and make predictions about a variety of patterns, including those found in real-life contexts C1.2 create and translate repeating, growing, and shrinking patterns involving rational numbers using various representations, including algebraic expressions and equations for linear growing and shrinking patterns C1.3 determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in growing and shrinking patterns involving rational numbers, and use	X - - -

- Explore how machines and mechanisms in the industry gather objects and understand important design principles to an intake mechanism. - Discover design principles needed for intake or shooting systems. - Explore ways to use the REV parts to develop intakes and shooters. - Explore ways to expand your kit of parts with 3D printing and other supplies you might have access to. - Experiment with trajectory, speed, and velocity to propel objects. **Linear Motion Lesson 4** - Know how to calculate mechanical advantage for a pulley system. - Apply your knowledge of calculating speed to a pulley system. - Gain a better understanding of how to design linear slides and pulley systems. - Understand different ways of achieving linear motion through worm gears and rack and pinions.		algebraic representations of the pattern rules to solve for unknown values in linear growing and shrinking patterns C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions C2.4 solve inequalities that involve integers, and verify and graph the solutions C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code C4. apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations	- x x x
	Data	D1.1 identify situations involving one-variable data and situations involving two-variable data, and explain when each type of data is needed D1.2 collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values D1.3 select from among a variety of graphs, including scatter plots, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data D1.5 use mathematical language, including the terms “strong”, “weak”, “none”, “positive”, and “negative”, to describe the relationship between two variables for various data sets with and without outliers D1.6 analyse different sets of data presented in various ways, including in scatter plots and in misleading graphs, by asking and answering questions about the data, challenging preconceived notions, and drawing conclusions, then make convincing arguments and informed decisions D2.2 determine and compare the theoretical and experimental process	- - - - - -
	Spatial Sense	E1.2 make objects and models using appropriate scales, given their top, front, and side views or their perspective views E1.3 use scale drawings to calculate actual lengths and areas, and reproduce scale drawings at different ratios E1.4 describe and perform translations, reflections, rotations, and dilations on a Cartesian plane, and predict the results of these transformations E2.2 solve problems involving angle properties, including the properties of intersecting and parallel lines and of polygons E2.3 solve problems involving the perimeter, circumference, area, volume, and surface area of composite two-dimensional shapes and three-dimensional objects, using appropriate formulas E2.4 describe the Pythagorean relationship using various geometric models, and apply the theorem to solve problems involving an unknown side length for a given right triangle	

Improving through Iteration I			
Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
Iteration and the Product Life Cycle Lesson 1 - Explore problem-solving strategies such as improving reliability, functionality, and craftsmanship. - Explore how increasing the functionality and optimality of a design can increase reliability. - Use design criteria to evaluate project needs and priorities for improvement. - Understand productive struggle and the product life cycle and its effect on the design and iteration process. - Use design criteria and project management to make robot improvements and track those improvements.	(SEL) Skills and the Mathematical Processes	2. To the best of their ability, students will learn to recognize sources of stress and cope with challenges to select and use a variety of concrete, visual, and electronic learning tools and appropriate strategies to investigate mathematical ideas and to solve problems so they can recognize that testing out different approaches to problems and learning from mistakes is an important part of the learning process, and is aided by a sense of optimism and hope.	X
Mechanism Improvement Lesson 2 - Explore machines that operate with reliability and precision. - Research ways that other mechanisms in the industry complete similar tasks. - Identify the shortest path for the object to be transported from point A to point B. - Prototype and improve your mechanism design.	Geometry	E1.2 make objects and models using appropriate scales, given their top, front, and side views or their perspective views	-
		E1.3 use scale drawings to calculate actual lengths and areas, and reproduce scale drawings at different ratios	-
		E1.4 describe and perform translations, reflections, rotations, and dilations on a Cartesian plane, and predict the results of these transformations	-
		E2.2 solve problems involving angle properties, including the properties of intersecting and parallel lines and of polygons	-
		E2.3 solve problems involving the perimeter, circumference, area, volume, and surface area of composite two-dimensional shapes and three-dimensional objects, using appropriate formulas	-
		E2.4 describe the Pythagorean relationship using various geometric models, and apply the theorem to solve problems involving an unknown side length for a given right triangle	-
	Data	D1.1 identify situations involving one-variable data and situations involving two-variable data, and explain when each type of data is needed	-
		D1.2 collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values	-
		D1.3 select from among a variety of graphs, including scatter plots, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs	-
		D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data	-
		D1.5 use mathematical language, including the terms “strong”, “weak”, “none”, “positive”, and “negative”, to describe the relationship between two variables for various data sets with and without outliers	-
			-

		D1.6 analyse different sets of data presented in various ways, including in scatter plots and in misleading graphs, by asking and answering questions about the data, challenging preconceived notions, and drawing conclusions, then make convincing arguments and informed decisions D2.2 determine and compare the theoretical and experimental process	- -
Algorithm Improvement Lesson 3 - Explore problem-solving strategies such as improving reliability, functionality, and craftsmanship. - Explore how increasing the functionality and optimality of a design can increase reliability. - Use design criteria to evaluate project needs and priorities for improvement. - Understand productive struggle and the product life cycle and its effect on the design and iteration process. - Use design criteria and project management to make robot improvements and track those improvements.	Algebra	C1.1 identify, describe, extend, create, and make predictions about a variety of patterns, including those found in real-life contexts C1.2 create and translate repeating, growing, and shrinking patterns involving rational numbers using various representations, including algebraic expressions and equations for linear growing and shrinking patterns C1.3 determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in growing and shrinking patterns involving rational numbers, and use algebraic representations of the pattern rules to solve for unknown values in linear growing and shrinking patterns C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions C2.4 solve inequalities that involve integers, and verify and graph the solutions C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code C4. apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations	- - - - - - - - - -

Project Sprints and Competition

Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
The math standards listed for this module are applied and reinforced in each lesson as students prepare for a class presentation and competition.			
Conducting a Project Management Sprint Lesson 1 - Understand and apply the process of a project management sprint. - Use a time crunch with deadlines to tackle many tasks quickly. - Identify priorities for completion. - Monitor and ensure that we make progress. - Use workforce skills to prepare for our competition day. **Communication and Presentation Lesson 2** - Explore presentation elements including an elevator pitch, business pitch, and bringing an idea to an audience. - Explore things you should and shouldn't do in a presentation. - Understand how to identify your strengths and weaknesses. - Explore ways to communicate about strengths and weaknesses. - Develop and present your team to an audience. **Learning Portfolio Lesson 3** -Identify and communicate about your career and technical skills using your strengths. - Develop a portfolio that demonstrates the skills you have acquired in the course. - Gain feedback from your team on how well you have communicated your skills.	(SEL) Skills and the Mathematical Processes	4. To the best of their ability, students will learn to build relationships and communicate effectively as they select from and create a variety of representations of mathematical ideas (e.g., representations involving physical models, pictures, numbers, variables, graphs), and apply them to solve problems so they can see themselves as capable math learners, and strengthen their sense of ownership of their learning, as part of their emerging sense of identity and belonging.	X
	Number	B1.1 represent and compare very large and very small numbers, including through the use of scientific notation, and describe various ways they are used in everyday life	x
		B1.4 use fractions, decimal numbers, and percents, including percents of more than 100% or less than 1%, interchangeably and flexibly to solve a variety of problems	x
	Algebra	C1.1 identify and compare a variety of repeating, growing, and shrinking patterns, including patterns found in real-life contexts, and compare linear growing and shrinking patterns on the basis of their constant rates and initial values	x
		C1.2 create and translate repeating, growing, and shrinking patterns involving rational numbers using various representations, including algebraic expressions and equations for linear growing and shrinking patterns	x
		C1.4 create and describe patterns to illustrate relationships among rational numbers	x
	Data	D1.3 select from among a variety of graphs, including scatter plots, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs	x
		D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data	x
		D1.5 use mathematical language, including the terms "strong", "weak", "none", "positive", and "negative", to describe the relationship between two variables for various data sets with and without outliers	x
	Geometry	E1.3 use scale drawings to calculate actual lengths and areas, and reproduce scale drawings at different ratios	x
		E2.2 solve problems involving angle properties, including the properties of intersecting and parallel lines and of polygons	x
		E2.3 solve problems involving the perimeter, circumference, area, volume, and surface area of composite two-dimensional shapes and three-dimensional objects, using appropriate formulas	x

Industry 4.0 and Your Community

Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
The math standards listed for this module are applied and reinforced in each lesson as students develop their own impact project.			
Industry 4.0 and Your Robot Lesson 1 - Understand Industry 4.0 technology and where I can find it in my daily life. - Discover big data and how it influences the ability to increase innovation. - Discover the Internet of Things and how it could change your future career. - Understand what artificial intelligence and machine learning are and how they apply to your robot. - Consider how you could use augmented reality to improve your own education and collaboration on your robot. **Industry 4.0 and Your Community Lesson 2** - Explore audiences to share your impact with. - Brainstorm the best method to share your learning in your community. - Develop a project management plan for sharing your learning. **Community Impact Project** - Explore ethical concerns around Industry 4.0. - Explore ways you can make an impact on others. - Develop a plan to make an impact in your community through a project, awareness, or education of Industry 4.0 and the future. ******Sample guidance for student Impact Project to Include these math standards:*** *- Have students do analysis and research of how Big Data and Artificial Intelligence are influencing their future including their own financial literacy. Example site for with this research trend: https://towardsdatascience.com/the-growing-impact-of-ai-in-financial-services-six-examples-da386c0301b2*	(SEL) Skills and the Mathematical Processes	5. To the best of their ability, students will learn to develop self-awareness and sense of identity make connections among mathematical concepts, procedures, and representations, and relate mathematical ideas to other contexts (e.g., other curriculum areas, daily life, sports) as they make connections between math and everyday contexts to help them make informed judgements and decisions	x
	Number	B1.1 represent and compare very large and very small numbers, including through the use of scientific notation, and describe various ways they are used in everyday life	-
		B1.4 use fractions, decimal numbers, and percents, including percents of more than 100% or less than 1%, interchangeably and flexibly to solve a variety of problems	-
	Algebra	C1.1 identify and compare a variety of repeating, growing, and shrinking patterns, including patterns found in real-life contexts, and compare linear growing and shrinking patterns on the basis of their constant rates and initial values	-
		C1.4 create and describe patterns to illustrate relationships among rational numbers	-
		C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions	-
		C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code	-
		C4.0 apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations	-
	Data	D1.1 identify situations involving one-variable data and situations involving two-variable data, and explain when each type of data is needed	-
		D1.2 collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values	-
		D1.3 select from among a variety of graphs, including scatter plots, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs	-
		D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data	-
		D1.5 use mathematical language, including the terms “strong”, “weak”, “none”, “positive”, and “negative”, to describe the relationship between two variables for various data sets with and without outliers	-
		D1.6 analyse different sets of data presented in various ways, including in scatter plots and in misleading graphs, by asking and answering questions about the data, challenging preconceived notions, and drawing conclusions, then make convincing arguments and informed decision	-

- Have students design and market a product that involves Internet of Things devices.	Financial Literacy	F1.5 compare various ways for consumers to get more value for their money when spending, including taking advantage of sales and customer loyalty and incentive programs, and determine the best choice for different scenarios F1.6 compare interest rates, annual fees, and rewards and other incentives offered by various credit card companies and consumer contracts to determine the best value and the best choice for different scenarios	- -

Sensors, Machine Learning, and Java

Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
Sensors and Feedback Lesson 1 - Understand touch, color, and encoder capabilities for providing feedback to the robot. - Decompose sensor data to determine how it collects and receives data. - Develop algorithmic thinking through utilizing Boolean data, program flow, and decisions to improve the robot. - Utilize decision trees to understand program flow and decisions that are made. - Develop a robot program that includes increased program flow with compound Boolean data, operators, and functions. *As students develop algorithms for sensors they should focus on the data or number sense provided by the hardware. They should apply mental math strategies while determining how the data should be manipulated to achieve a desired output.* *These algorithms should involve the Algebra math strands as they use them to develop their algorithms. These are not directly covered in content but are applied in the suggested algorithms and tutorials to test and utilize sensors*.	(SEL) Skills and the Mathematical Processes	6. To the best of their ability, students will learn to think critically and creatively and develop and apply reasoning skills (e.g., classification, recognition of relationships, use of counter-examples) to justify thinking, make and investigate conjectures, and construct and defend arguments so they can work through challenging math problems, understanding that their resourcefulness in using various strategies to respond to stress is helping them build personal resilience.	X
	Number	B1.2 describe, compare, and order numbers in the real number system (rational and irrational numbers), separately and in combination, in various contexts B1.4 use fractions, decimal numbers, and percents, including percents of more than 100% or less than 1%, interchangeably and flexibly to solve a variety of problems B2.1 use the properties and order of operations, and the relationships between operations, to solve problems involving rational numbers, ratios, rates, and percents, including those requiring multiple steps or multiple operations B2.3 use mental math strategies to multiply and divide whole numbers and decimal numbers up to thousandths by powers of ten, and explain the strategies used B2.4 add and subtract integers, using appropriate strategies, in various contexts B2.8 compare proportional situations and determine unknown values in proportional situations, and apply proportional reasoning to solve problems in various contexts	- - - - - -
	Algebra	C1.1 identify and compare a variety of repeating, growing, and shrinking patterns, including patterns found in real-life contexts, and compare linear growing and shrinking patterns on the basis of their constant rates and initial values C1.4 create and describe patterns to illustrate relationships among rational numbers C2.1 add and subtract monomials with a degree of 1, and add binomials with a degree of 1 that involve integers, using tools C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions C2.4 solve inequalities that involve integers, and verify and graph the solutions	x X X X X

		C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code	X X
Developing Functions and States Lesson 2 - Explore the machine states and how they provide feedback for robot control. - Explore ways of creating abstraction in code through functions. - Use the robot Inertial Measurement Unit to improve robot navigation through functions. - Consider autonomous states of your robot and use abstraction to create functions using states for an autonomous program	Number	B1.2 describe, compare, and order numbers in the real number system (rational and irrational numbers), separately and in combination, in various contexts B1.4 use fractions, decimal numbers, and percents, including percents of more than 100% or less than 1%, interchangeably and flexibly to solve a variety of problems B2.1 use the properties and order of operations, and the relationships between operations, to solve problems involving rational numbers, ratios, rates, and percents, including those requiring multiple steps or multiple operations B2.3 use mental math strategies to multiply and divide whole numbers and decimal numbers up to thousandths by powers of ten, and explain the strategies used B2.4 add and subtract integers, using appropriate strategies, in various contexts B2.5 add and subtract fractions, using appropriate strategies, in various contexts B2.6 multiply and divide fractions by fractions, as well as by whole numbers and mixed numbers, in various contexts B2.7 multiply and divide integers, using appropriate strategies, in various contexts B2.8 compare proportional situations and determine unknown values in proportional situations, and apply proportional reasoning to solve problems in various contexts	X X X X X X X x
	Algebra	C1.1 identify and compare a variety of repeating, growing, and shrinking patterns, including patterns found in real-life contexts, and compare linear growing and shrinking patterns on the basis of their constant rates and initial values C1.4 create and describe patterns to illustrate relationships among rational numbers C2.1 add and subtract monomials with a degree of 1, and add binomials with a degree of 1 that involve integers, using tools C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions C2.4 solve inequalities that involve integers, and verify and graph the solutions C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code	X X - - - X X
Developing Robot Machine Learning Lesson 3 - Explore decision trees and how they help a robot make decisions.	Algebra	C1.1 identify and compare a variety of repeating, growing, and shrinking patterns, including patterns found in real-life contexts, and compare linear growing and shrinking patterns on the basis of their constant rates and initial values	X

- Understand what machine learning is and the process used to develop machine learning modules. - Discover the prebuilt machine learning models using TensorFlow and Vuforia. - Decompose a machine learning template and use it to perform robot actions. **Cont. Developing Robot Machine Learning**		C1.4 create and describe patterns to illustrate relationships among rational numbers C2.1 add and subtract monomials with a degree of 1, and add binomials with a degree of 1 that involve integers, using tools C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions C2.4 solve inequalities that involve integers, and verify and graph the solutions C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code	X X X X X X
	Data	D1.1 identify situations involving one-variable data and situations involving two-variable data, and explain when each type of data is needed D1.2 collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values D1.3 select from among a variety of graphs, including scatter plots, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data D1.5 use mathematical language, including the terms “strong”, “weak”, “none”, “positive”, and “negative”, to describe the relationship between two variables for various data sets with and without outliers D1.6 analyse different sets of data presented in various ways, including in scatter plots and in misleading graphs, by asking and answering questions about the data, challenging preconceived notions, and drawing conclusions, then make convincing arguments and informed decision	X X X X X x
Object-Oriented Programming Lesson 3 - Explore how to enable Java to compare your Blocks programs to Java programs. - Explore the syntax of Java programming. - Discover Java as an object-oriented programming environment. - Discover the Java code repository to explore inheritance, classes, methods, and objects. - Use tutorials to develop Java programs for creating an op mode and programming a motor and a sensor.	Algebra	C1.1 identify and compare a variety of repeating, growing, and shrinking patterns, including patterns found in real-life contexts, and compare linear growing and shrinking patterns on the basis of their constant rates and initial values C1.4 create and describe patterns to illustrate relationships among rational numbers C2.1 add and subtract monomials with a degree of 1, and add binomials with a degree of 1 that involve integers, using tools C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions C2.4 solve inequalities that involve integers, and verify and graph the solutions C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions	X X X X X X X

		C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code	
Improving through Iteration II			
Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
[Mechanism Improvement Lesson 1] - Explore the path the game object is taking. - Study the physics behind the design. - Research additional manufacturer ways of improving the use of materials. - Consider better fabrication of the design. - Prototype and improve your mechanism design.	(SEL) Skills and the Mathematical Processes	2. To the best of their ability, students will learn to recognize sources of stress and cope with challenges to select and use a variety of concrete, visual, and electronic learning tools and appropriate strategies to investigate mathematical ideas and to solve problems so they can recognize that testing out different approaches to problems and learning from mistakes is an important part of the learning process, and is aided by a sense of optimism and hope.	X
	Geometry	E1.2 make objects and models using appropriate scales, given their top, front, and side views or their perspective views	x
		E1.3 use scale drawings to calculate actual lengths and areas, and reproduce scale drawings at different ratios	X
		E1.4 describe and perform translations, reflections, rotations, and dilations on a Cartesian plane, and predict the results of these transformations	-
		E2.2 solve problems involving angle properties, including the properties of intersecting and parallel lines and of polygons	-
		E2.3 solve problems involving the perimeter, circumference, area, volume, and surface area of composite two-dimensional shapes and three-dimensional objects, using appropriate formulas	-
		E2.4 describe the Pythagorean relationship using various geometric models, and apply the theorem to solve problems involving an unknown side length for a given right triangle	-
	Data	D1.1 identify situations involving one-variable data and situations involving two-variable data, and explain when each type of data is needed	-
		D1.2 collect continuous data to answer questions of interest involving two variables, and organize the data sets as appropriate in a table of values	-
		D1.3 select from among a variety of graphs, including scatter plots, the type of graph best suited to represent various sets of data; display the data in the graphs with proper sources, titles, and labels, and appropriate scales; and justify their choice of graphs	-
		D1.4 create an infographic about a data set, representing the data in appropriate ways, including in tables and scatter plots, and incorporating any other relevant information that helps to tell a story about the data	-
		D1.5 use mathematical language, including the terms “strong”, “weak”, “none”, “positive”, and “negative”, to describe the relationship between two variables for various data sets with and without outliers	-

Algorithm Improvement Lesson 2 - Explore the steps to add additional hardware and data needed for the hardware. - Identify the data needed for additional hardware and how the data will need to be processed to achieve additional functionality. - Use the engineering design process to understand what will be needed from an algorithm standpoint to add functionality to the robot.	Algebra	C1.1 identify, describe, extend, create, and make predictions about a variety of patterns, including those found in real-life contexts C1.2 create and translate repeating, growing, and shrinking patterns involving rational numbers using various representations, including algebraic expressions and equations for linear growing and shrinking patterns C1.3 determine pattern rules and use them to extend patterns, make and justify predictions, and identify missing elements in growing and shrinking patterns involving rational numbers, and use algebraic representations of the pattern rules to solve for unknown values in linear growing and shrinking patterns C2.3 solve equations that involve multiple terms, integers, and decimal numbers in various contexts, and verify solutions C2.4 solve inequalities that involve integers, and verify and graph the solutions C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code C4. apply the process of mathematical modelling to represent, analyse, make predictions, and provide insight into real-life situations	- - - - - - - - - -
Conducting a Project Management Sprint Lesson 3 - Understand and apply the process of a project management sprint. - Use a time crunch with deadlines to tackle many tasks quickly. - Identify priorities for completion. - Monitor and ensure that we make progress. - Use workforce skills to prepare for our competition day.	(SEL) Skills and the Mathematical Processes	4. To the best of their ability, students will learn to build relationships and communicate effectively as they select from and create a variety of representations of mathematical ideas (e.g., representations involving physical models, pictures, numbers, variables, graphs), and apply them to solve problems so they can see themselves as capable math learners, and strengthen their sense of ownership of their learning, as part of their emerging sense of identity and belonging.	X

Learning Pathways and Career Exploration			
Lesson Outcomes	**Strand**	**Specific Expectations**	**Addressed**
Learning Pathways Lesson 1 - Explore team roles on a *FIRST*® competitive team and their correlation to jobs in different industries. - Learn the benefits of being on a competitive team that can advance regionally and internationally. -Identify how opportunities on a competitive team can help you achieve scholarships, internships, and industry credentials.			
Résumé Lesson 2 -Understand the principles of writing a good résumé. -Understand the difference between an entry-level résumé and a professional résumé. - Build your own résumé that demonstrates the impact you make with your workforce and technical skills.			
Portfolio Lesson 3 -Identify and communicate about your career and technical skills using your strengths. - Develop a portfolio that demonstrates the skills you have acquired in the course. - Gain feedback from your team on how well you have communicated your skills.		***See standards in Industry 4.0 Unit***	