Physical Science- Motion and Matter

Content Area: **Science**
Course(s): **Grade 3**
Time Period: **Third Trimester**
Length: **12 Weeks**
Status: **Published**

Unit Overview

This unit provides students with physical sciences core ideas dealing with forces and interactions, matter and its interactions, and with engineering design. Magnetism and gravity are the forces students explore as they look for patterns of motion to predict future motion. Students work with magnets and paper clips, wheel-and-axle systems, paper air twirlers, and rotating tops. Students use their knowledge of science to enter the engineering design process and through the process refine their understanding.

Students build on the science concepts of matter and its interactions developed in grade 2 using new tools to quantify observations. Students use metric tools to refine observations by measuring mass and volume, they make mixtures and solutions to develop a foundational understanding of conservation of mass, and they observe a simple chemical reaction to extend their understanding of conservation. These new experiences with matter will prepare students for disciplinary core ideas introduced in grade 5.

Throughout the unit, students engage in science and engineering practices to collect data to answer questions, and to define problems in order to develop solutions. Students reflect on their own use of these practices and find out about how others use these practices in science and engineering careers.

STAGE 1- DESIRED RESULTS

Educational Standards

2020 New Jersey Student Learning Standards- Science

Performance Expectations

Physical Sciences

SCI.3-PS2	Motion and Stability: Forces and Interactions
SCI.3-PS2-4	Define a simple design problem that can be solved by applying scientific ideas about magnets.
SCI.3-PS2-1	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
SCI.3-PS2-3	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
SCI.3-PS2-2	Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

Life Sciences

SCI.3-LS4-2	Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
SCI.3-LS4-3	Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
SCI.3-LS1	From Molecules to Organisms: Structures and Processes
SCI.3-LS4	Biological Evolution: Unity and Diversity
SCI.3-LS4-4	Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
SCI.3-LS4-1	Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
SCI.3-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.3-LS1-1	Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
SCI.3-LS2-1	Construct an argument that some animals form groups that help members survive.
SCI.3-LS3	Heredity: Inheritance and Variation of Traits
SCI.3-LS3-1	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
SCI.3-LS3-2	Use evidence to support the explanation that traits can be influenced by the environment.

Earth and Space Sciences

SCI.3-ESS2-1	Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
SCI.3-ESS2-2	Obtain and combine information to describe climates in different regions of the world.
SCI.3-ESS3	Earth and Human Activity
SCI.3-ESS2	Earth's Systems

SCI.3-ESS3-1	Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Engineering Design

SCI.3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
SCI.3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
SCI.3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Science and Engineering Practices

- Practice 1: Asking Questions and Defining Problems
- Practice 2: Developing and Using Models
- Practice 3: Planning and Carrying Out Investigations
- Practice 4: Analyzing and Interpreting Data
- Practice 5: Using Mathematics and Computational Thinking
- Practice 6: Constructing Explanations and Designing Solutions
- Practice 7: Engaging in Argument from Evidence
- Practice 8: Obtaining, Evaluating, and Communicating Information

Cross Cutting Concepts

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Functions
- Stability and Change

Disciplinary Core Ideas

Physical Sciences

- PS1. Matter and Its Interaction
- PS1.A: Structure and Properties of Matter
- PS1.B: Chemical Reactions
- PS1.C: Nuclear Processes
- PS2. Motion and Stability: Forces of Interaction
- PS2.A: Forces and Motion
- PS2.B: Types of Interactions
- PS2.C: Stability and Instability in Physical Systems
- PS3. Energy
- PS3.A: Definitions of Energy
- PS3.B: Conservation of Energy and Energy Transfer
- PS3.C: Relationship Between Energy and Forces
- PS3.D: Energy and Chemical Processes in Everyday Life
- PS4. Waves and Their Applications in Technologies for Information Transfer
- PS4.A: Wave Properties
- PS4.B: Electromagnetic Radiation
- PS4.C: Information Technologies and Instrumentation

Life Sciences

- LS1. From Molecules to Organisms: Structure and Processes
- LS1.A: Structure and function
- LS1.B: Growth and development of organisms
- LS1.C: Growth and development of organisms
- LS1.D: Information Processing
- LS2. Ecosystems: Interactions, Energy, and Dynamics
- LS2.A: Interdependent relationships in ecosystems
- LS2.B: Cycles of matter and energy transfer in ecosystems
- LS2.C: Ecosystem dynamics, functioning, and resilience
- LS2.D: Social interactions and group behavior
- LS3. Heredity: Inheritance and Variation of Traits
- LS3.A: Inheritance of traits
- LS3.B: Variation of traits
- LS4. Biological Evolution: Unity and Diversity
- LS4.A: Evidence of common ancestry and diversity
- LS4.B: Natural selection
- LS4.C: Adaptation
- LS4.D: Biodiversity and humans

Earth and Space Sciences

- ESS1. Earth's Place in the Universe
- ESS1.A: The universe and its stars
- ESS1.B: Earth and the solar system
- ESS1.C: The history of planet Earth
- ESS2. Earth's System
- ESS2.A: Earth materials and systems
- ESS2.B: Plate tectonics and large-scale system interactions
- ESS2.C: The roles of water in Earth's surface processes
- ESS2.D: Weather and climate
- ESS2.E: Biogeology
- ESS3. Earth and Human Activity
- ESS3.A: Natural resources
- ESS3.B: Natural hazards
- ESS3.C: Human impacts on Earth systems
- ESS3.D: Global climate change

Essential Questions

Investigation 1: Forces

Part 1: What happens when magnets interact with other magnets and with paper clips?

Part 2: How is the magnetic field affected when more magnets are added?

Part 3: What causes change of motion?

Investigation 2: Patterns of Motion

Part 1: How can we change the motion of wheels rolling down ramps?

Part 2: What rules help predict where a rolling cup will end up?

Part 3: Student-created question, e.g., What happens to the motion of a twirly bird when the wing length changes?

Part 4: What is the best design for a top?

Investigation 3: Engineering

Part 1: What are some important features of a cart that will roll from here to there?

Part 2: How can you improve the design of your cart?

Part 3: Student-created question, e.g., How does the start position affect how far a cart rolls?

Part 4: How can you use magnets to do cart tricks?

Investigation 4: Mixtures

Part 1: What happens when you mix two materials?

Part 2: What happens when you mix two materials?

Part 3: What is the importance of accurate measurements for a metric field?

Enduring Understanding

This physical science unit develops students' understanding of how to: 1) Explain and predict interactions between objects and within systems of objects; and 2) Explain the structure, properties, and interactions of matter.

Students will know...

VOCABULARY

Investigation 1: Forces

attract, balanced, change of motion, data, direction, evidence, force, gravity, magnet, magnetic field, magnetic force, magnetism, model, motion, observe, pattern, practice, predict, prediction, pull, push, repel, science practices, strength, unbalanced

Investigation 2: Patterns of Motion

axis, axle, friction, outcome, pattern of motion, ramp, rotate, shaft, slope, standard, system, top, twirly bird, variable, wheel

Investigation 3: Engineering

bearing, centimeter (cm), constraint, criterion, engineer, meter (m), metric system, solution, standard unit, start position

Investigation 4: Mixtures

baking soda, calcium carbonate, carbon dioxide, chalk, chemical reaction, cloudy, conservation of mass, dissolve, mixture, salt, sand, solution, suspend, transparent, vinegar

Students will be able to...

Investigation 1: Forces

- Ask questions about how magnets interact with other magnets and paper clips; about other forces at work in the natural world.
- Develop and use models to describe their thinking about how magnets interact with each other and with paper clips, describing invisible magnetic field.
- Plan and carry out investigations to determine how magnets interact with each other and paper clips, and to determine how a magnetic field changes when multiple magnets are used together.
- Analyze and interpret data in order to predict the distance at which two magnets will attract a paper clip.

Investigation 2: Patterns of Motion

- Ask questions about how to change the motion of wheel-and-axle systems, twirly birds, and tops.
- Plan and carry out investigations to determine patterns of motion, using wheel-and-axle systems, rolling cups, and twirly birds.
- Analyze and interpret data to make sense of cause-and-effect relationships, using twirly birds.
- Construct explanations using wheel-and-axle systems to predict patterns of motion and design solutions by designing tops that spin for a long time.
- Obtain, evaluate, and communicate information about forces involved in rotating tops.

Investigation 3: Engineering

- Ask questions and define problems about the motion of carts on slopes.
- Plan and carry out investigations of the patterns of motion of carts on slopes and the design of carts to accomplish specific tasks.
- Analyze and interpret data collected from observations of moving carts.
- Construct explanations and design solutions based on data from moving carts.
- Obtain, evaluate, and communicate information from books and media and integrate it with first-hand experiences to construct explanations about the practices of scientists and engineers.

Investigation 4: Mixtures

- Plan and carry out investigations with mixtures of solids and solids, and solids and liquids.
- Analyze and interpret data collected from their investigations of mixtures and solutions.
- Construct explanations based on their measurements of mass to see that mass is conserved in mixtures.
- Engage in argument from evidence about chemical reactions.

Obtain, evaluate, and communicate information from books and media and integrate that with first-hand experiences to construct explanations about the importance of the metric system.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment Suggestions

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments Suggestions

Investigation 1: Forces

- Survey
- Science notebook entries
- Performance assessment
- Response sheet
- Investigation 1 I-check

Investigation 2: Patterns of Motion

- Science notebook entries
- Performance assessment
- Response sheet
- Investigation 2 I-check

Investigation 3: Engineering

- Science notebook entries
- Performance assessment
- Investigation 3 I-check

Investigation 4: Mixtures

- Science notebook entries

Performance assessment

Benchmark Assessments

Unit Post Test

STAGE 3- LEARNING PLAN

Instructional Map

Investigation 1: Forces

Investigation 2: Patterns of Motion

Investigation 3: Engineering

Investigation 4: Mixtures

Investigation 1: Forces

Investigation 1: Part 1 – Two Forces

Students explore the forces of magnetism and gravity. They bring two magnets close to each other and find that sometimes the magnets pull each other together and sometimes they push each other away. Students recognize that both magnetism and gravity can pull, and magnetism can sometimes push as well. Both forces can make things move even when not in direct contact with another object.

Content:

- Magnetic interactions between a pair of objects does not require that the objects be in contact.
- The strength of the magnetic force depends on the properties of the objects and their distance apart.
- How magnets interact depends on their orientation (sometimes they attract and sometimes they repel).
- Gravity is the force that pulls masses toward the center of Earth.

Investigation 1: Part 2 – Magnetism-Force Investigation

Students build on the observations they made in Part 1 and look for patterns in data to predict how far the magnetic field extends around two magnets. Students collect data for one and three magnets, measuring the distance at which paper clips are attracted. They use those data to predict how far the magnetic field extends around two magnets. Students use and discuss science practices in the context of investigating magnetic fields.

Content:

- Magnetic interactions between a pair of objects does not require that the objects be in contact.
- The strength of the magnetic force depends on the properties of the objects and their distance apart.

Investigation 1: Part 3 – More about Forces

Building on their experiences with magnetic force, students explore other pushes and pulls. They expand their understanding of force to include a force's strength and direction, and more about the effects of balanced and unbalanced forces.

Content:

- A force is a push or pull.
- Each force acting on an object has both strength and direction.
- When an object is at rest, the sum of the forces acting on the object is zero; the forces are balanced.
- Unbalanced forces (pushes or pulls) cause change of motion.

Investigation 2: Patterns of Motion

Investigation 2: Part 1 – Wheel-and-Axle Systems

Students set up cardboard ramps down which they roll plastic disks. They put the disks on shafts to make wheel-and-axle systems. They try all kinds of configurations of wheel size, axle length, and axle position to meet a variety of challenges.

Content:

- The patterns of an object's motion in various situations can be observed and measured.
- A wheel-and-axle system with two sizes of wheels describes a curved path when rolled down a slope. The system curves toward the smaller wheel.

Investigation 2: Part 2 – Predicting Motion of New Systems

Students roll paper cups down ramps and grapple with the different behaviors of rolling systems with two different-sized wheels. They observe the way cups roll and use the predictable curved rolling path to meet challenges. They put cups together to make them roll straight and weight them in various ways to see how weight affects rolling.

Content:

- A wheel-and-axle system with two sizes of wheels describes a curved path when rolled down a slope. The system curves toward the smaller wheel.
- When past motion exhibits a regular pattern, future motion can be predicted from it.

Investigation 2: Part 3 – Twirly Birds

Students make twirly birds (flying spinners) that create motion from the interaction of the forces of gravity and air friction (air resistance). First they create a standard twirly bird; then the class focuses on science practices as they investigate variables. Students take their twirly birds outdoors to find out if they are the same.

Content:

- A twirly bird is a simple winged system that spins when it interacts with air.
- Twirler performance is affected by variables, including wing size, shape, and angle.

Investigation 2: Part 4 – Tops

Students make tops from plastic disks and shafts, and spin them by applying a torque force to the shaft. After finding the arrangement of parts that produces the best top, they use the tops to look at different designs as they spin. Finally, they look at the path that a drawing top reveals as it spins.

Content:

- Tops exhibit rotational motion (spinning) when torque is applied to the axial shaft.
- Top performance is affected by variables including speed, disk mass, and diameter.

Investigation 3: Engineering

Investigation 3: Part 1 – From Here to There

Students tackle an engineering challenge. The only criterion given is that whatever is created must be able to roll from one place to another with a small push or pull. The two constraints are a restricted set of materials and a time limit. This challenge provides the foundation for science learning and engineering activities throughout the rest of the investigation.

Content:

- Possible solutions to a problem are limited by available materials and resources (constraints).
- The success of a designed solution is determined by considering the desired features of a solution (criteria).
- Compare different proposals for solutions on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

Investigation 3: Part 2 – Distance Challenge

Students get second a chance to build carts and improve their designs. Once they have a new working cart, students are challenged to make it roll farther or stop shorter than the initial trial distances that they recorded. The meter (m) and centimeter (cm) are reviewed as the measurement units used by scientists to measure distance.

Content:

- Research on a problem should be carried out before beginning to design a solution. Testing a solution involves evaluating how well it performs under a range of likely conditions.
- Communicating with peers about proposed design solutions can lead to improved designs.

Investigation 3: Part 3 – Investigating Start Position

Students investigate start position. They assemble new carts and investigate how start position affects the distance the cart will travel. Students plan and conduct this investigation on their own, and discuss their investigation procedures and how they can be improved.

Content:

- The pattern of an object's or a system's motion in various situations can be observed and measured.
- When past motion exhibits a regular pattern, it can be used to predict future motion.

Investigation 3: Part 4 – Cart Tricks

Students modify their systems (carts) to meet new challenges. They use their knowledge of magnets to resolve new engineering challenges.

Content:

- Possible solutions to a problem are limited by available materials and resources (constraints).
- The success of a designed solution is determined by considering the desired features of a solution (criteria).

Investigation 4: Mixtures

Investigation 4: Part 1 – Mixing Solids and Liquids

Students make four different mixtures, one that includes two solids and three that use 50 mL of water and one of three solids (sand, chalk, or salt). In one mixture, the solid salt dissolves, resulting in a solution. Students determine the mass of the salt and water and compare the sum to the mass of the solution to observe that the salt is still present, even though it is not visible.

Content:

- A mixture is two or more materials distributed evenly throughout one another.

- A special class of mixture, a solution, results when a solid material dissolves (disappears) in a liquid.
- Mass is neither created nor destroyed during physical and chemical interactions. Matter is conserved.

Investigation 4: Part 2 – Reactions

Students determine the mass of a volume of vinegar and baking soda before mixing them. They observe bubbling and fizzing, evidence that a new material – carbon dioxide gas – formed. The new material is evidence that a chemical reaction occurred. Students determine that the mass of the mixture after the bubbling stops is less than the mass of the original materials. This change in mass pushes students to infer that carbon dioxide has mass, which went into the air.

Content:

- Starting materials change into new materials during chemical reactions.
- Mass is neither created nor destroyed during physical and chemical interactions. Matter is conserved.

Investigation 4: Part 3 – Metric Field Day

Students plan and participate in an outdoor field day featuring metric measurement. The events can call for estimation, speed, accuracy, or problem solving, and they deal with the skill of metric measurement. It is a day of fun, enriched with light-hearted competition. Students evaluate the events and suggest ways to redesign them for future competitions.

Content:

- Apply measurement concepts learned throughout the module.

Modifications/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding

- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language

- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Extended Time
- Frequent Breaks
- Highlighted Text

- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-Direct
- Repeated Drill / Practice
- Shortened Assignments
- Teacher Notes
- Tutorials
- Use of Additional Reference Material
- Use of Audio Resources

High Preparation Differentiation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Menu Assignments
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation Differentiation

- Choice of Book / Activity

- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Extend Skills
- Mini Workshops to Re-teach
- Open-ended Activities
- Think-Pair-Share by Interest
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Readiness
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Integration- Interdisciplinary Connections

New Jersey Student Learning Standards for Mathematics

N-Q.A.Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; chose and interpret the scale and the origin in graphs and data displays
2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose the level of accuracy appropriate to limitations on measurement when reporting quantities.

N-CN.A. Perform arithmetic operations with complex numbers.

1. Know there is a complex number.
2. Use the commutative, associative, and distributive properties.

A-SSE.A. Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.

A-SSE.B. Write expressions in equivalent forms to solve problems.

1. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

F-IF.A. Understand the concept of a function and use functional notation.

1. Understand that a function from one set to another set.

F-IF.B Interpret functions that arise in applications in terms of the context.

F-IF.C. Analyze functions using different representations

S-ID.A. Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on a real number line.

S-ID.B. Summarize, represent, and interpret data on two categorical and quantitative variables.

S-ID.C. Interpret linear models.

S-IC.A. Understand and evaluate random processes underlying statistical experiments.

S-IC.B. Make inferences and justify conclusions from surveys, experiments, and observational studies.

English Language Arts Standards – Grade 3

RI 1: Ask and answer questions about key details.

RI 2: Identify main topic and retell key details.

RI 3: Describe the connection between two ideas.

RI 4: Ask and answer questions about unknown words.

RI 5: Identify the front cover, back cover, and title page of a book.

RI 6: Distinguish their own point of view from that of the author of the text.

RI 7: Describe the relationship between illustrations and the text.

RI 8: Identify the reasons an author gives to support points.

RI 9: Identify similarities in and differences between text on the same topic.

RI 10: Actively engage in group reading activities with purpose and understanding.

SL 1: Participate in collaborative conversations.

SL 2: Ask and answer questions about key details and request clarification.

SL 3: Ask and answer questions to seek help, information, or to clarify.

SL 4: Describe with details.

SL 5: Add drawings or other visual displays to recounts of experiences.

L 4: Determine or clarify the meaning of unknown or multiple meaning words and phrases.

L 4c: Use a known root word as a clue to the meaning of an unknown word.

L 5: Demonstrate understanding of word relationships and nuances in word meanings.

L 6: Use acquired words and phrases.

W 1: Write opinion pieces.

W 2: Write informational text.

W 3: Write narratives.

W 7: Conduct short research projects.

W 8: Recall from experience and gather information from print; take brief notes and sort evidence into provided categories.

RF 3: Apply word analysis skills in decoding words.

RF 4: Read text with purpose and understanding.

2020 New Jersey Student Learning Standards- Computer Science and Design Thinking

Computer Science and Design Thinking Practices

CSDT.K-12.CSDTP1	Fostering an Inclusive Computing and Design Culture
CSDT.K-12.CSDTP2	Collaborating Around Computing and Design
CSDT.K-12.CSDTP3	Recognizing and Defining Computational Problems
CSDT.K-12.CSDTP4	Developing and Using Abstractions
CSDT.K-12.CSDTP5	Creating Computational Artifacts
CSDT.K-12.CSDTP6	Testing and Refining Computational Artifacts
CSDT.K-12.CSDTP7	Communicating About Computing and Design

8.2 Design Thinking

8.2.5.ED.1: Explain the functions of a system and its subsystems. 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints). 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process. 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.
8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system. 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have. 8.2.5.ITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use. 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career.
8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem. 8.2.5.NT.2: Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies. 8.2.5.NT.3: Redesign an existing product for a different purpose in a collaborative team. 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts

technologies.
8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems. 8.2.5.ETW.2: Describe ways that various technologies are used to reduce improper use of resources. 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved. 8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment. 8.2.5.ETW.5: Identify the impact of a specific technology on the environment and determine what can be done to increase positive effects and to reduce any negative effects, such as climate change.
8.2.5.EC.1: Analyze how technology has contributed to or reduced inequities in local and global communities and determine its short- and long-term effects.

2020 New Jersey Student Learning Standards- Career Readiness, Life Literacies, and Key Skills

Career Readiness, Life Literacies, and Key Skills Practices

CRP.K-12.CRP1	Act as responsible and contributing community members and employee.
CRP.K-12.CRP2	Attend to financial well-being.
CRP.K-12.CRP3	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP4	Demonstrate creativity and innovation.
CRP.K-12.CRP5	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP6	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP7	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP8	Use technology to enhance productivity, increase collaboration and communicate effectively.
CRP.K-12.CRP9	Work productively in teams while using cultural/global competence.

9.2 Career Awareness and Planning

9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes. 9.2.5.CAP.2: Identify how you might like to earn an income. 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations. 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

9.4 Life Literacies and Key Skills

9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6). 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7). 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a). 9.4.5.CI.4: Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).
9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2). 9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1). 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems. 9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).
9.4.5.DC.1: Explain the need for and use of copyrights. 9.4.5.DC.2: Provide attribution according to intellectual property rights guidelines using public domain or creative commons media. 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have copyright restrictions. 9.4.5.DC.4: Model safe, legal, and ethical behavior when using online or offline technology (e.g., 8.1.5.NI.2). 9.4.5.DC.5: Identify the characteristics of a positive and negative online identity and the lasting implications of online activity. 9.4.5.DC.6: Compare and contrast how digital tools have changed social interactions (e.g., 8.1.5.IC.1). 9.4.5.DC.7: Explain how posting and commenting in social spaces can have positive or negative consequences. 9.4.5.DC.8: Propose ways local and global communities can engage digitally to participate in and

promote climate action (e.g., 6.3.5.GeoHE.1).
9.4.5.IML.1: Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., *Social Studies Practice* - Gathering and Evaluating Sources). 9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3). 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data. 9.4.5.IML.4: Determine the impact of implicit and explicit media messages on individuals, groups, and society as a whole. 9.4.5.IML.5: Distinguish how media are used by individuals, groups, and organizations for varying purposes. (e.g., 1.3A.5.R1a). 9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions (e.g., RI.5.7, 6.1.5.HistoryCC.7, 7.1.NM. IPRET.5). 9.4.5.IML.7: Evaluate the degree to which information meets a need including social emotional learning, academic, and social (e.g., 2.2.5. PF.5).
9.4.5.TL.1: Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each. 9.4.5.TL.2: Sort and filter data in a spreadsheet to analyze findings. 9.4.5.TL.3: Format a document using a word processing application to enhance text, change page formatting, and include appropriate images graphics, or symbols. 9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a). 9.4.5.TL.5: Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).

Vertical Integration- Discipline Mapping

PS1: Grade 1: Sound and Light

Grade 2: Solids and Liquids; Pebbles, Sand, and Silt

Grade 5: Earth and Sun; Mixtures and Solutions

Grade 8: Chemical Interactions

PS2: Kindergarten: Materials and Motion

Grade 4: Energy

Grade 5: Earth and Sun

Grade 7: Electromagnetic Force, Gravitational, and Kinetic Forces

Preparation for high school science courses

Additional Materials

Visit FOSSWEB.com for list of websites, and additional readings.