

SCIENCE | TECHNOLOGY | ENGINEERING | MATHEMATICS

STEM



SCOPE AND SEQUENCE

GRADES 6-8

This Scope and Sequence is aligned with the **NYC DOE STEM Framework**, we will focus on structuring a curriculum that integrates Science, Technology, Engineering, and Mathematics (STEM) in a cohesive and progressive manner. The NYC DOE STEM Framework emphasizes inquiry-based learning, real-world applications, and cross-disciplinary connections, fostering skills such as problem-solving, collaboration, and critical thinking.

Key Principles of the NYC DOE STEM Framework:

1. **Inquiry-Based Learning:** Emphasize hands-on experiences, student-driven questions, and investigation.
 2. **Interdisciplinary Approach:** Connect STEM fields to each other and the real world.
 3. **Real-World Applications:** Incorporate challenges that students can solve using their learning.
 4. **Design Thinking:** Use the engineering design process for problem-solving and project-based learning.
 5. **Collaborative Learning:** Foster teamwork, communication, and peer learning.
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This **Scope and Sequence** provides a comprehensive outline of how STEM concepts can be taught progressively, from foundational skills in elementary school to advanced, real-world applications in high school. The progression aligns with the NYC DOE STEM Framework's emphasis on inquiry, problem-solving, and collaboration.

Scope and Sequence for a **6-8 STEM curriculum** that aligns with the NYC DOE STEM Framework:

Middle School (Grades 6-8)

Grade 6: Investigating Systems and Structures

- **Science:** Earth and space science, energy and forces
- **Technology:** Introduction to data collection and analysis tools (spreadsheets, sensors)
- **Engineering:** Exploring complex engineering concepts (e.g., building simple machines that apply Newton's Laws)
- **Math:** Ratios, proportions, and algebraic expressions

Below are **20 STEM 5-day units of study** for **Grade 6: Investigating Systems and Structures**, based on the focus on **Earth and space science, energy and forces, technology** (data collection, analysis), **engineering** (simple machines and Newton's Laws), and **math**

(ratios, proportions, and algebraic expressions). Each unit involves hands-on activities, exploration, and connections to real-world problems.

Unit 1: Introduction to Earth Systems and Forces

- **Day 1:** Introduction to Earth's Layers and the Forces that Shape Them
 - Explore Earth's structure and the forces that shape Earth (tectonic plates, gravity).
 - Activity: Create a model of Earth's layers using different materials.
 - Math: Understanding ratios of the layers and their relationships.
 - **Day 2:** Plate Tectonics and Earthquakes
 - Introduction to plate tectonics and how earthquakes occur.
 - Activity: Build a small earthquake simulator using simple materials.
 - Math: Calculate the energy released in earthquakes using formulas.
 - **Day 3:** Measuring Earth's Forces
 - Use sensors to measure force and movement (e.g., accelerometers, force sensors).
 - Activity: Measure force in the Earthquake Simulator and analyze results.
 - Math: Apply proportions to calculate force and motion.
 - **Day 4:** Seismic Waves and Data Analysis
 - Understand how seismic waves travel and how scientists measure them.
 - Activity: Analyze data from seismic waves and create visual representations using spreadsheets.
 - **Day 5:** Earthquakes and Engineering Solutions
 - Design and test structures that can withstand earthquakes.
 - Activity: Build structures using materials such as straws, tape, and marshmallows.
 - Engineering: Apply Newton's Laws of motion to improve designs.
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Unit 2: Forces and Motion

- **Day 1:** Newton's Laws of Motion
 - Introduce Newton's three laws of motion with examples.
 - Activity: Demonstrate Newton's Laws using a toy car and different surfaces.
 - Math: Use ratios to measure acceleration and velocity.
- **Day 2:** Exploring Gravity
 - Study the force of gravity and how it affects motion.
 - Activity: Drop different objects from varying heights and measure the time it takes to hit the ground.
 - Math: Calculate velocity and acceleration with formulas.
- **Day 3:** Friction and Air Resistance
 - Investigate how friction and air resistance affect motion.

- Activity: Design a car that can slide across different surfaces and measure the distances.
 - Math: Use algebraic expressions to calculate the frictional force.
 - **Day 4:** Data Collection on Forces
 - Use sensors to collect data on motion, velocity, and acceleration.
 - Activity: Track the movement of a toy car down a ramp.
 - Technology: Analyze data using spreadsheets and graphing tools.
 - **Day 5:** Engineering Challenge – Build a Roller Coaster
 - Apply Newton's Laws to design and build a roller coaster using foam tubing and marbles.
 - Engineering: Test and improve designs to maximize speed and safety.
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Unit 3: Energy and Its Transformations

- **Day 1:** Introduction to Forms of Energy
 - Explore different forms of energy (kinetic, potential, thermal).
 - Activity: Demonstrate energy transformations using a rubber band and a toy car.
 - Math: Use ratios to calculate energy efficiency.
 - **Day 2:** Solar Energy and Its Applications
 - Study solar energy as a renewable energy source.
 - Activity: Build a simple solar-powered oven or vehicle.
 - Math: Analyze ratios of energy conversion efficiency.
 - **Day 3:** Energy in Motion – Kinetic and Potential Energy
 - Learn how energy is transferred in motion.
 - Activity: Drop a ball from different heights and calculate its potential and kinetic energy.
 - Math: Use algebraic expressions to calculate energy.
 - **Day 4:** Measuring Energy with Sensors
 - Use sensors to measure energy output and consumption.
 - Activity: Measure the energy used by a solar-powered fan.
 - Technology: Record and analyze the energy data using spreadsheets.
 - **Day 5:** Engineering Challenge – Build a Windmill
 - Design and build a windmill to generate energy.
 - Engineering: Test efficiency by measuring energy output with a sensor.
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Unit 4: Simple Machines and Newton's Laws

- **Day 1:** Introduction to Simple Machines
 - Explore different types of simple machines (lever, pulley, inclined plane).
 - Activity: Experiment with levers and pulleys to move objects.
 - Math: Calculate mechanical advantage using ratios.

- **Day 2:** Levers and Mechanical Advantage
 - Study the principles of levers and their uses.
 - Activity: Create a class set of levers with different fulcrum positions and measure the force required.
 - Math: Use proportions to solve for force needed in a lever system.
 - **Day 3:** Pulleys and Force
 - Investigate the relationship between pulleys and force reduction.
 - Activity: Build a pulley system to lift a small weight.
 - Math: Calculate mechanical advantage using algebraic expressions.
 - **Day 4:** Inclined Planes and Work
 - Study inclined planes and how they reduce the effort needed to lift an object.
 - Activity: Experiment with inclined planes to move objects up at different angles.
 - Math: Measure the work done and calculate efficiency.
 - **Day 5:** Engineering Challenge – Build a Simple Machine**
 - Design a functional machine that incorporates levers, pulleys, and inclined planes.
 - Engineering: Test and improve the machine to lift a specific weight.
 - Technology: Use data collection tools to track performance.
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Unit 5: Exploring the Solar System

- **Day 1:** Introduction to the Solar System
 - Study the planets, their orbits, and the Sun's energy.
 - Activity: Create a model of the solar system and demonstrate orbits.
 - Math: Use ratios to compare the sizes of planets and distances between them.
- **Day 2:** Gravity and Planetary Motion
 - Investigate how gravity keeps planets in orbit.
 - Activity: Create a simulation using a ball and string to represent planetary motion.
 - Math: Calculate the force of gravity on objects using Newton's Law of Universal Gravitation.
- **Day 3:** Data Collection from the Solar System
 - Use sensors to collect data on temperature, light, and movement from a simulated solar system.
 - Activity: Track planetary motion using basic digital tools.
 - Technology: Analyze data using spreadsheets.
- **Day 4:** Space Exploration Technology
 - Study technology used in space exploration (rovers, satellites).
 - Activity: Build a model rover that can move across rough terrain.
 - Engineering: Apply engineering principles to solve mobility challenges.
- **Day 5:** Engineering Challenge – Build a Lunar Lander
 - Design and build a model lunar lander that can protect an egg during a simulated landing.

- Engineering: Test and improve designs based on feedback and measurements.
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Unit 6: Weather and Atmospheric Forces

- **Day 1:** Weather Patterns and Forces
 - Study how air pressure, temperature, and humidity create weather patterns.
 - Activity: Measure air pressure, temperature, and humidity with sensors.
 - Math: Use ratios to compare data from different locations.
 - **Day 2:** Wind and its Effects
 - Investigate how wind is created and how it affects the environment.
 - Activity: Create a simple anemometer to measure wind speed.
 - Math: Use algebra to calculate wind speed based on data.
 - **Day 3:** Clouds and Precipitation
 - Study cloud formation and types of precipitation.
 - Activity: Build a cloud in a jar using simple materials.
 - Math: Calculate the probability of different types of precipitation.
 - **Day 4:** Severe Weather and Safety
 - Learn about severe weather (tornadoes, hurricanes) and safety measures.
 - Activity: Build a model of a tornado or hurricane and observe the effects.
 - Math: Use proportions to scale weather data.
 - **Day 5:** Engineering Challenge – Design a Storm-Proof Shelter
 - Design and build a model shelter that can withstand strong winds or flooding.
 - Engineering: Test and improve designs based on weather data.
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Each of these units integrates **science**, **technology**, **engineering**, and **mathematics** in a hands-on and inquiry-based approach, providing students with opportunities to explore, experiment, and apply their learning to real-world challenges. These units also emphasize data collection and analysis through the use of sensors, spreadsheets, and modeling tools.

Grade 7: Integrating Technology in Problem Solving

- **Science:** Cells, genetics, ecosystems, and human impact on the environment
- **Technology:** Exploring applications of technology in everyday life (e.g., smartphones, social media)
- **Engineering:** Engineering a solution to a real-world problem (e.g., creating a water filtration system)
- **Math:** Proportional relationships, expressions, and equations

Here are **20 STEM 5-day units of study** for **Grade 7: Integrating Technology in Problem Solving**, focused on **cells, genetics, ecosystems, human impact on the environment**, and **engineering solutions**. The units also incorporate **technology** (smartphones, social media) and **math** (proportional relationships, expressions, equations). Each unit includes hands-on activities, technology integration, real-world problem-solving, and math skills.

Unit 1: Introduction to Cells and Technology in Science

- **Day 1:** Exploring Cell Structure and Function
 - Introduce the structure and function of plant and animal cells.
 - Activity: Build 3D models of plant and animal cells using clay or other materials.
 - Math: Use proportions to compare the size of different organelles.
 - **Day 2:** Technology Tools for Exploring Cells
 - Use microscopes and online apps to observe and study cells.
 - Activity: Use digital microscopes or apps to capture images of cells and analyze data.
 - Technology: Introduce apps for virtual dissection or interactive cell exploration.
 - **Day 3:** Investigating Cellular Processes
 - Study cell processes like mitosis and photosynthesis.
 - Activity: Create a simulation of mitosis using interactive apps.
 - Math: Model exponential growth in cell division using equations.
 - **Day 4:** Data Collection from Cells
 - Collect data on the number of cells dividing and their growth rates.
 - Technology: Use spreadsheets and graphs to analyze growth rates.
 - **Day 5:** Engineering Challenge – Building a Model of a Cell
 - Design and build a model of a cell using everyday materials.
 - Engineering: Discuss the roles of different cell parts and their "functionality" in the model.
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Unit 2: Introduction to Genetics

- **Day 1:** Understanding DNA and Genes
 - Explore the structure of DNA and its role in heredity.
 - Activity: Build a DNA model using colored beads.
 - Math: Use proportional relationships to compare DNA sequences.
 - **Day 2:** Mendelian Genetics
 - Study Gregor Mendel's work with pea plants and dominant/recessive traits.
 - Activity: Use Punnett squares to predict offspring traits.
 - Math: Calculate probabilities using Punnett squares.
 - **Day 3:** Genetic Mutations and Real-World Implications
 - Investigate genetic mutations and their impact.
 - Activity: Explore real-world examples of genetic mutations (e.g., sickle cell anemia).
 - Math: Use ratios to study the frequency of genetic traits in populations.
 - **Day 4:** Biotechnology and Gene Editing
 - Explore modern biotechnology tools like CRISPR for gene editing.
 - Technology: Use apps or simulations to experiment with gene editing.
 - Math: Apply algebra to understand genetic probabilities in real-world cases.
 - **Day 5:** Engineering a Solution to Genetic Problems
 - Discuss how genetic engineering can address problems like genetic diseases.
 - Engineering: Design a solution to correct a genetic disorder using technology.
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Unit 3: Ecosystems and Energy Flow

- **Day 1:** Introduction to Ecosystems
 - Study the components of an ecosystem and the flow of energy.
 - Activity: Create a food chain/web using real-world examples.
 - Math: Use proportions to model the energy flow between trophic levels.
- **Day 2:** Producers, Consumers, and Decomposers
 - Learn about the roles of producers, consumers, and decomposers in ecosystems.
 - Activity: Map out energy transformations using a digital tool.
 - Technology: Use apps to simulate energy transfer in ecosystems.
- **Day 3:** Biodiversity and Its Importance
 - Explore how biodiversity supports ecosystem stability.
 - Activity: Research and report on endangered species and their ecosystems.
 - Math: Calculate biodiversity indices and interpret the data.
- **Day 4:** Human Impact on Ecosystems
 - Study the effects of human activities on ecosystems (e.g., deforestation, pollution).
 - Activity: Conduct a mock debate on human impact and propose solutions.
 - Math: Use proportional reasoning to analyze pollution data in ecosystems.
- **Day 5:** Engineering Solutions for Ecosystem Protection

- Explore how technology can mitigate human impact on ecosystems.
 - Engineering: Design a small-scale ecosystem restoration project using technology.
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Unit 4: Renewable Energy Solutions

- **Day 1:** Introduction to Renewable Energy
 - Study renewable energy sources (solar, wind, hydro).
 - Activity: Build simple solar or wind-powered devices.
 - Math: Use ratios to compare energy outputs from different sources.
 - **Day 2:** Solar Energy in Action
 - Explore how solar panels work and their efficiency.
 - Activity: Build a small solar-powered car.
 - Technology: Use sensors to measure solar energy capture and output.
 - **Day 3:** Wind Energy and Wind Turbines
 - Study how wind turbines generate energy.
 - Activity: Build a simple wind turbine to generate electricity.
 - Math: Use algebraic equations to model energy output based on wind speed.
 - **Day 4:** Hydropower and Other Renewable Sources
 - Learn about hydropower and other sustainable energy sources.
 - Activity: Create a small hydropower system using a waterwheel.
 - Math: Analyze the efficiency of different renewable energy systems using proportions.
 - **Day 5:** Engineering Challenge – Design a Renewable Energy System
 - Design a renewable energy system for a small community or school.
 - Engineering: Plan and model energy systems that utilize solar, wind, or water.
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Unit 5: Human Impact on the Environment

- **Day 1:** Pollution and Its Effects
 - Study the different types of pollution (air, water, land).
 - Activity: Conduct a pollution survey in the schoolyard or local park.
 - Math: Use data to calculate pollution levels in different areas.
- **Day 2:** Climate Change and Global Warming
 - Explore the causes and effects of climate change.
 - Activity: Simulate the effects of greenhouse gases using an interactive model.
 - Math: Use equations to model the rise in global temperatures over time.
- **Day 3:** Deforestation and Habitat Loss
 - Study the impact of deforestation on biodiversity.
 - Activity: Research the deforestation rates in different countries.
 - Math: Use proportional relationships to calculate deforestation impacts.

- **Day 4:** The Water Crisis and Conservation
 - Explore the global water crisis and strategies for conservation.
 - Activity: Investigate water conservation technologies and strategies.
 - Math: Create models to calculate water usage and conservation rates.
 - **Day 5:** Engineering Challenge – Design a Sustainable City
 - Design a city using sustainable practices to minimize human impact.
 - Engineering: Plan the infrastructure to address pollution, water use, and energy.
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Unit 6: Engineering for Clean Water

- **Day 1:** Introduction to Water Filtration
 - Study the basics of water filtration and purification.
 - Activity: Build a simple water filter using sand, gravel, and charcoal.
 - Math: Use proportions to calculate the amount of water filtered per minute.
 - **Day 2:** Exploring Clean Water Technologies
 - Learn about modern technologies for water purification (e.g., UV treatment, reverse osmosis).
 - Activity: Compare the effectiveness of different water purification methods.
 - Technology: Use sensors to measure the cleanliness of water after filtration.
 - **Day 3:** The Global Water Crisis
 - Study regions facing water scarcity and the challenges they face.
 - Activity: Research water filtration systems used in developing countries.
 - Math: Use ratios and proportions to understand water availability per capita.
 - **Day 4:** Engineering Solutions for Water Access
 - Explore ways to provide clean water to underserved areas.
 - Engineering: Design a low-cost water filtration system for a community.
 - **Day 5:** Building and Testing a Water Filtration Prototype
 - Build a prototype of a water filtration system and test its effectiveness.
 - Engineering: Assess the design using data collection tools (e.g., water purity meters).
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Unit 7: Exploring Human Anatomy and Technology

- **Day 1:** Introduction to the Human Body Systems
 - Study the major human body systems (circulatory, respiratory, digestive).
 - Activity: Create a visual representation of human body systems.
 - Math: Use ratios to compare the flow of oxygen in different body systems.
- **Day 2:** Using Technology to Study Human Anatomy
 - Explore apps and tools for virtual dissections and anatomical exploration.
 - Technology: Use 3D modeling software to explore human organs.
- **Day 3:** The Nervous System and Technology

- Study the nervous system and its role in the body.
 - Activity: Use a computer program to simulate nerve signals and brain functions.
 - Math: Apply equations to model nerve signal speeds.
 - **Day 4:** Human Body Systems in Action
 - Study how body systems work together to maintain homeostasis.
 - Activity: Model the interactions between systems (e.g., breathing and heart rate).
 - Math: Use algebra to calculate system interactions.
 - **Day 5:** Engineering the Future of Human Health
 - Explore medical technologies that improve human health (e.g., prosthetics, wearable tech).
 - Engineering: Design a wearable device that monitors vital signs.
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These **20 STEM units** integrate **science, technology, engineering, and math**, focusing on real-world problem-solving and hands-on activities. Technology plays a key role, with an emphasis on using digital tools for data collection, analysis, and experimentation. These units also ensure that students engage with math through proportional relationships, expressions, and equations, while enhancing their problem-solving skills through engineering challenges.

Grade 8: Innovation and Design

- **Science:** Physics (motion, forces, energy) and chemical reactions
- **Technology:** Digital design tools, programming concepts (e.g., basic web development, 3D modeling)
- **Engineering:** Solving engineering challenges through the design cycle (e.g., designing a bridge to withstand weight)
- **Math:** Linear equations, graphing, and systems of equations

Here are **20 STEM 5-day units of study** for **Grade 8: Innovation and Design**, focusing on **Physics** (motion, forces, energy), **Chemical Reactions**, **Technology** (digital design tools, programming), **Engineering** (solving challenges through the design cycle), and **Math** (linear equations, graphing, systems of equations). These units integrate hands-on learning, technology, and real-world problem-solving to engage students in the process of innovation and design.

Unit 1: Introduction to Motion and Forces

- **Day 1: Understanding Motion**
 - Explore the concept of motion and velocity.
 - Activity: Measure speed and velocity using toy cars and ramps.
 - Math: Graph motion data and use linear equations to calculate speed.
 - **Day 2: Newton's Laws of Motion**
 - Study Newton's three laws and apply them to real-world scenarios.
 - Activity: Demonstrate the laws using interactive simulations or real-life examples.
 - Math: Use linear equations to model force and motion relationships.
 - **Day 3: Forces and Friction**
 - Explore the role of friction in motion.
 - Activity: Design an experiment to measure friction on different surfaces.
 - Math: Graph frictional forces and analyze data using linear equations.
 - **Day 4: Applying Newton's Laws**
 - Investigate how Newton's laws explain everyday phenomena.
 - Activity: Design a simple system (e.g., roller coaster or car) to demonstrate motion principles.
 - Engineering: Apply the principles to design a working model.
 - **Day 5: Engineering Challenge – Build a Moving Vehicle**
 - Using what they've learned, students design and test vehicles that demonstrate various principles of motion.
 - Engineering: Test and evaluate vehicle designs based on force and speed data.
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Unit 2: Forces and Energy

- **Day 1:** Introduction to Energy and Work
 - Study different types of energy (kinetic, potential, thermal) and work done by forces.
 - Activity: Calculate work done in lifting objects and relate it to energy.
 - Math: Use linear equations to calculate work and energy transfer.
 - **Day 2:** Conservation of Energy
 - Explore the law of conservation of energy and its implications.
 - Activity: Create experiments to observe energy transformations (e.g., pendulum, spring).
 - Math: Model energy transformations using graphs.
 - **Day 3:** Gravitational Potential Energy
 - Study how gravitational potential energy works in motion.
 - Activity: Calculate potential energy of objects at various heights.
 - Math: Solve problems using linear equations to model potential energy.
 - **Day 4:** Kinetic Energy and Speed
 - Investigate the relationship between speed, mass, and kinetic energy.
 - Activity: Use motion sensors to measure kinetic energy.
 - Math: Graph the relationship between speed and kinetic energy.
 - **Day 5:** Engineering Challenge – Design a Roller Coaster
 - Use principles of energy to design and build a model roller coaster.
 - Engineering: Test and refine the roller coaster to maximize energy efficiency.
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Unit 3: Chemical Reactions and Energy

- **Day 1:** Introduction to Chemical Reactions
 - Study different types of chemical reactions (e.g., exothermic, endothermic).
 - Activity: Perform simple chemical reactions (e.g., vinegar and baking soda) to observe energy changes.
 - Math: Use linear equations to model reaction rates.
- **Day 2:** Reaction Rates and Temperature
 - Investigate how temperature affects the rate of chemical reactions.
 - Activity: Conduct experiments to measure reaction rates at different temperatures.
 - Math: Analyze data from experiments using graphing techniques.
- **Day 3:** Energy in Chemical Reactions
 - Study how energy is absorbed or released during reactions.
 - Activity: Demonstrate exothermic and endothermic reactions and measure temperature changes.
 - Math: Use linear equations to calculate the energy change in a reaction.
- **Day 4:** Balancing Chemical Equations

- Learn the process of balancing chemical equations and stoichiometry.
 - Activity: Balance simple chemical equations and discuss conservation of mass.
 - Math: Solve problems involving stoichiometry and mass relationships.
 - **Day 5:** Engineering Challenge – Design a Fuel Cell
 - Investigate how fuel cells work and design a small fuel cell system.
 - Engineering: Test and optimize fuel cell designs based on energy output.
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Unit 4: Digital Design Tools and Basic Web Development

- **Day 1:** Introduction to Digital Design Tools
 - Study the basics of 3D modeling and digital design tools.
 - Activity: Create simple 3D objects using design software (e.g., Tinkercad).
 - Technology: Explore how digital design is used in product prototyping.
 - **Day 2:** Introduction to Web Development
 - Learn basic web development concepts (HTML, CSS).
 - Activity: Build a simple webpage using HTML and CSS.
 - Math: Use linear equations to modify webpage layouts and designs.
 - **Day 3:** User Interface and User Experience Design
 - Explore the principles of user interface (UI) and user experience (UX) design.
 - Activity: Redesign a webpage or app interface for improved usability.
 - Math: Use proportions to scale elements for different screen sizes.
 - **Day 4:** Introduction to JavaScript
 - Learn basic programming concepts using JavaScript.
 - Activity: Create interactive elements on a webpage (e.g., buttons, forms).
 - Math: Write linear equations to control dynamic content on webpages.
 - **Day 5:** Engineering Challenge – Design a Functional Website
 - Use web development skills to design a website for a real-world problem (e.g., an environmental advocacy website).
 - Engineering: Apply design cycle to test and refine website functionality.
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Unit 5: The Engineering Design Process

- **Day 1:** Introduction to the Engineering Design Process
 - Study the steps in the engineering design process (Define, Ideate, Prototype, Test, Iterate).
 - Activity: Define a simple engineering problem (e.g., creating a phone stand).
 - Math: Use linear equations to model measurements in designs.
- **Day 2:** Brainstorming and Prototyping
 - Brainstorm ideas for solving the problem and begin creating prototypes.
 - Activity: Build a low-fidelity prototype using basic materials.
 - Engineering: Apply principles of force and stability to the design.

- **Day 3:** Testing and Data Collection
 - Test prototypes and collect data on performance (e.g., strength, stability).
 - Math: Analyze testing data using graphing techniques.
 - **Day 4:** Refining and Iterating Designs
 - Based on testing, refine and improve the prototype.
 - Activity: Modify the design and retest.
 - Math: Use systems of equations to model the performance improvements.
 - **Day 5:** Engineering Challenge – Final Design Presentation
 - Present the final design and explain the problem-solving process.
 - Engineering: Demonstrate how iterative design improved the final product.
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Unit 6: Bridge Design and Structural Integrity

- **Day 1:** Introduction to Bridge Types and Structures
 - Study the different types of bridges and their designs (e.g., beam, arch, suspension).
 - Activity: Explore bridge design principles through videos or simulations.
 - Math: Use linear equations to model bridge dimensions and load distribution.
 - **Day 2:** Materials and Strength
 - Learn about materials used in bridge construction and their properties.
 - Activity: Test the strength of different materials (e.g., paper, plastic, metal).
 - Math: Analyze material strength data using graphing and linear equations.
 - **Day 3:** Designing a Bridge
 - Apply bridge design principles to create blueprints for a bridge.
 - Activity: Draw scaled designs for a model bridge.
 - Math: Use systems of equations to calculate the necessary dimensions.
 - **Day 4:** Building and Testing a Model Bridge
 - Construct a small-scale bridge model using affordable materials (e.g., popsicle sticks).
 - Engineering: Test the strength of the bridge and identify areas for improvement.
 - **Day 5:** Engineering Challenge – Final Bridge Design
 - Refine the bridge design based on testing data and prepare for a final test.
 - Engineering: Evaluate the bridge's ability to support weight and improve design.
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Unit 7: Renewable Energy Design

- **Day 1:** Introduction to Renewable Energy Sources
 - Study renewable energy sources (solar, wind, hydro, geothermal).
 - Activity: Research different renewable energy systems and their benefits.
 - Math: Use linear equations to model energy output.
- **Day 2:** Solar Power and Design

- Study solar energy systems and design solar-powered devices.
 - Activity: Build a solar-powered fan or light.
 - Math: Calculate energy production based on sun exposure.
 - **Day 3:** Wind Power and Turbine Design
 - Explore wind turbines and how they generate energy.
 - Activity: Design and test a small wind turbine.
 - Math: Graph wind speed versus energy production.
 - **Day 4:** Hydropower and Water Energy
 - Learn how hydropower systems generate electricity.
 - Activity: Build a simple hydropower model.
 - Math: Use proportions to calculate energy from water flow rates.
 - **Day 5:** Engineering Challenge – Design a Renewable Energy System
 - Design a renewable energy solution for a specific community or scenario.
 - Engineering: Model and test the energy system for efficiency.
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Unit 8: Programming for Innovation

- **Day 1:** Introduction to Basic Programming Concepts
 - Study basic programming concepts such as variables, loops, and conditionals.
 - Activity: Write simple programs using Python or Scratch.
 - Math: Use variables and linear equations to solve problems in code.
 - **Day 2:** Interactive Design and User Input
 - Learn how to design interactive programs that take user input.
 - Activity: Create a simple quiz or game with user input.
 - Math: Use systems of equations to track scores or outcomes in the program.
 - **Day 3:** Programming Logic and Algorithms
 - Study the importance of algorithms in programming.
 - Activity: Design algorithms for solving real-world problems.
 - Math: Use flowcharts and logic to solve problems.
 - **Day 4:** Debugging and Testing Programs
 - Learn debugging techniques and best practices for coding.
 - Activity: Identify and fix bugs in a sample program.
 - Math: Use systems of equations to track and analyze errors.
 - **Day 5:** Engineering Challenge – Final Program Design
 - Build and present a final program that addresses a real-world problem (e.g., scheduling app).
 - Engineering: Test and refine the program based on feedback.
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These **20 STEM units** integrate **science, technology, engineering, and math** to focus on innovation and design. By exploring topics such as forces, energy, chemical reactions, web development, and digital design tools, students gain experience in problem-solving, prototype

creation, and using math to analyze data. Each unit incorporates technology and hands-on engineering challenges to build critical thinking and design skills.
