01: Basic Skills

Content Area: **Science**
Course(s): **Physics**
Time Period: **September**
Length: **20 days**
Status: **Published**

Unit Overview:

The purpose of this unit is to give students the background in the basic skills that they will need for the rest of the year. Students will learn how to use metric prefixes to express really big and really small numbers. Students will learn how to find relationships from graphs. Students will learn how to solve problems using their algebra and geometry skills.

In this unit of study, students are expected to *plan and conduct investigations*, *analyze data and using math to support claims*, and *apply scientific ideas to solve design problems. The crosscutting concepts of patterns, cause and effect, and systems and systems models are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate proficiency in planning and conducting investigations, analyzing data and using math to support claims, and applying scientific ideas to solve design problems and to use these practices to demonstrate understanding of the core ideas*

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Enduring Understandings:

- Behavior of objects with constant acceleration can be discovered through motion equations.
- You can learn about the motion of an object by looking at graphs of position vs time, or velocity vs time.
- Acceleration is the rate of velocity change
- Metric prefixes allow you to easily communicate large and small numbers
- Velocity is speed plus direction

Essential Questions:

- How can we learn the formula that relates two variables to each other?
- How can we make predictions about the motion of moving objects?

Standards/Indicators/Student Learning Objectives (SLOs):

- SWBAT apply the proper equations of motion to an object in motion
- SWBAT create position vs time or velocity vs time graphs from the collected data of the motion of an object.
- SWBAT create properly constructed graphs and determine the proper type of graph that fits a collected data set.
- SWBAT derive the equations of motion for an object moving at a constant acceleration.
- SWBAT describe the motion of an object from a position vs time, or velocity vs time graph
- SWBAT determine what information can be determined from the slope or area under a position vs time, or velocity vs time graph
- SWBAT differentiate between speed, velocity, position, distance, and displacement
- SWBAT isolate variables in an equation, and use the proper equations to find the area, volume, and density of various shapes.
- SWBAT use metric prefixes to represent large and small values.

SCI.HS-LS1	From Molecules to Organisms: Structures and Processes
9-12.HS-ETS1-4.4.1	Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows— within and between systems at different scales.
9-12.HS-ETS1-2.6	Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles and theories.
9-12.HS-ETS1-3.6.1	Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
9-12.HS-ETS1-4.ETS1.B.1	Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.
9-12.HS-PS1-3.1.1	students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale; thus requiring improved investigations and experiments. They use mathematical representations to identify certain patterns and analyze patterns of performance in order to reengineer and improve a designed system.
9-12.HS-PS1-1.2	Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
9-12.HS-PS1-1.2.1	Use a model to predict the relationships between systems or between components of a system.
9-12.HS-PS1-4.2.1	Develop a model based on evidence to illustrate the relationships between systems or

	between components of a system.
9-12.HS-PS3-2.2.1	Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.
9-12.HS-PS2-1.2.1	students understand that empirical evidence is required to differentiate between cause and correlation and to make claims about specific causes and effects. They suggest cause and effect relationships to explain and predict behaviors in complex natural and designed systems. They also propose causal relationships by examining what is known about smaller scale mechanisms within the system. They recognize changes in systems may have various causes that may not have equal effects.
9-12.HS-PS2-3.2.1	Systems can be designed to cause a desired effect.
9-12.HS-PS2-5.3	Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.
9-12.HS-PS2-5.3.1	Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
9-12.HS-PS3-1.4.1	Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models.
9-12.HS-PS2-2.4.1	When investigating or describing a system, the boundaries and initial conditions of the system need to be defined.
9-12.HS-PS1-2.6	Constructing Explanations and Designing Solutions
9-12.HS-PS2-3.6.1	Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects.
9-12.HS-PS2-3.ETS1.A.1	Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.
9-12.HS-PS2-3.ETS1.C.1	Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed.

Lesson Titles

- Basic Graphing
- Equations of Motion
- Graphing Motion
- Math & Algebra Review
- Metric System and Engineering Notation
- Motion Terminology

Equity Considerations

Asian American and Pacific Islander Mandate

Lessons will include multiple perspectives from the Asian American and Pacific Islander population.

https://ideas.ted.com/8-asian-americans-and-pacific-islanders-whose-innovations-have-changed-your-life-really/

- Social

LGBTQ and Disabilities Mandate

Lessons will include multiple perspectives from the LGBTQ and Disabilities population, including Sally Ride (NASA Scientist).

STEM

LGBTQ:

Sir Francis Bacon (1561–1626)

Florence NightingaleFrancis Bacon | Philosophy, Scientific Method, & Facts | Britannica(1820-1910)

George Washington Carver (1861-1943)

Sara Josephine Baker (1873-1945)

Alan Turing (1912-1954)

Allan Cox (1926-1987)

Sally Ride (1951-2012)

Ben Barres (1954-2017)

Ruth Gates (1962-2018)

Tim Cook (1960)

Disabilities:

Leonardo da Vinci (1452-1519)- Dyslexia

Isaac Newton (1664-1727)- Epilepsy

Thomas Edison (1847-1931)- Hearing

Charles Darwin (1809-1882)- Stutter, Dyslexia

Alexander Graham Bell (1847-1922)- Deaf

Albert Einstein (1879-1955)- Aspergers

Florence B. Seibert (1897-1991)- Mobility

Stephen Hawking (1942-2019)- ALS

John Forbes Nash (1928-2015)-
Schizophrenia

Temple Grandin (1947)- Autism

- Social

Climate Change

Students will engage in discussion centered around climate change and its relationship to physics.

https://tropicsu.org/tag/physics-toolkit/

This lesson plan will help you teach various Physics concepts such as power, energy, and dynamics through the working of a wind turbine. In the context of global warming due to carbon emissions, wind power is a renewable and clean source of energy that can be harnessed as electricity by wind turbines. Thus, this lesson plan will enable the students to apply the concepts of energy, electrical energy, and power in a real-world scenario.

- Economic
- Social

SCI.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).

Inter-Disciplinary Connections:

LA.RH.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, qualitatively, as well as in words) in order to address a question or solve a problem.
LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LA.RST.11-12.10	By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
LA.WHST.11-12.1.A	Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
LA.WHST.11-12.1.B	Develop claim(s) and counterclaims using sound reasoning and thoroughly, supplying the

	most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
LA.WHST.11-12.1.C	Use transitions (e.g., words, phrases, clauses) to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
LA.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.11-12.2.E	Provide a concluding paragraph or section that supports the argument presented.
LA.WHST.11-12.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Activity: Speed from Google Earth. This activity will give you practice finding speed by measuring distance on Google Maps or Google Earth
- Classwork (Moderate): Equations of Motion Practice. A series of problems to make sure you are able to work with the equations of motion
- Classwork/Homework: Speed Challenge This activity will give you practice at quickly determining unknowns from the speed equation
- Homework: Application of Terms. This activity is one that you will be doing on your own to show that you can apply what you have learned in class to something in your own life
- Homework: Multiplication Review Activity. You must be able to score a (20 or better academic) or (25 or better honors) on this activity. You may need to do this same program on a test or quiz in the upcoming days.
- Lab Activity: Graphing Circles: Students will be collecting data and then determining the formulas that best fit that data.
- Lab Activity: Quick Grapher On-line graphing practice. Practice graphing relationships with an online graphing tool.
- Live Graphs. A set of the major graph types that shows what they look like and what happens when you vary your constant
- Notes on speed, velocity, acceleration, position, distance and displacemen
- Notes on working with metric prefixes and on some of the base units of the metric system.
- Ownwork: Graphing Motion. A series of problems looking at analyzing the motion of objects that created different kinds of graphs.
- Ownwork: Metric Knowledge. This quick quiz will evaluate how well you are able to judge the reasonableness of a measurement using the metric system.
- Activity: Speed in Traffic. This activity is designed to test your ability to estimate a speed based on the dynamic highway signs that give the times to different locations
- Class Activity: Finding Formulas: Students will be using already created graphs to determine the formulas that best fit that data.
- Class Activity: Multiple Datasets: Students will get some practice using Logger Pro to create multiple datasets and display them on a single graph.
- Classwork (Hard): Equations of Motion Practice. A series of problems to make sure you are able to work with the equations of motion.

- Classwork: Extreme Speeds. This activity is a series of word problems that will give you practice using the formulas learned in motion terminology and also to make sure you have a good grasp of your math skills and conversion skills.
- Classwork: Graphing Practice. You will be creating a few simple graphs in Logger Pro and then using the graphs to find the relationships between different variables.
- Classwork: Usain Bolt's 100 m Record Run. Create graphs of position vs. time and velocity vs. time for Usain Bolt's world record run.
- Classwork: Worksheet on Graphing Motion. A few sample problems for students to answer based on motion graphs.
- Classwork/Homework: Acceleration Challenge This activity will give you practice at quickly determining accelerations based on the movement of a car's speedometer
- Classwork/Homework: Motion Terminology Self Test. This activity will give you practice applying the terms displacement, distance, speed and velocity
- Homework: Annotating a Motion Graph. A quick activity to introduce you to google drawings and how you can use them to annotate a graph.
- Homework: Graphing with Logger Pro. Practicing using Logger Pro to find equations for a graph.
- Homework: Metric Prefix Game. A way to make sure you can convert things to a metric prefix very quickly
- Lab Activity: Developing formulas from a Graph: Students will be collecting data and then determining the formulas that best fit that data.
- Lab Activity: Graphing the Motion of a Car In this activity you will be using a motion sensor analyze the motion of an object as it starts from rest and eventually returns to rest.
- Lab Activity: Mass vs. Length Lab: Students will be collecting data and then determining the formulas that best fit that data.
- Notes for Math Review
- Notes on how graphs can be used to study motion
- Notes on parts of a good graph as well as what we can learn through the use of graphs
- Notes on the equations of motion for objects moving with a constant acceleration38
- Ownwork: Graphing Practice. Some practice problems dealing with identifying what you can learn from different types of graphs.
- Ownwork: Mathematics Review Problems: Some more practice with problems dealing with algebra and other math skills
- Ownwork: Motion Equation Problems. Practice problems involving motion equations.
- Ownwork: Practice for Quiz 1.1
- Ownwork: Speed and Acceleration Problems. Some practice with problems dealing with speed and acceleration
- OwnWork: Unit Conversions. This link will take you to a random worksheet generator that will give you practice converting values from one unit to another
- OwnWork: Working with the Metric System. This homework will help you practice all the skills you need to have to be successful with the metric system.
- OwnWork: Writing numbers with a Metric Prefix. This link will take you to a random worksheet generator that will give you practice writing numbers with and without metric prefixes.
- Reference: Logger Pro Help. Here is a file that will help you get the most out of Logger Pro.

Modifications

- Tutoring During Delsea 1

ELL Modifications:

- Repeat, reword and clarify
- Digital Translators
- Focus on domain specific vocabulary and key words
- Offer sources for specific topics in primary language (Youtube web resources)
- Use real objects when possible

IEP & 504 Modifications:

- Formula sheets and example problems to use on assessments
- Modeling and showing various examples
- Scaffolding Notes
- Students will be albe to use calculators and/or other math tools

G&T Modifications:

- Extra labs to do outside the classroom
- Provide links to extension videos or other media
- Increase the level of problems and challenge problems

At Risk Modifications

- Utilize Delsea One to complete assignments, try supplemental material or to modify classroom behaviors
- Reach out to parents

Formative Assessment:

- Quiz 1.1 Motion Terminology and Math Review
- Quiz 1.2: Metric System, and Basics of Graphing
- Quiz 1.3: Equations of Motion and Graphing Motion

Summative Assessment:

- Lab Assessment: Metric System, Graphing and Motion

- MPA 1 Assessment
- Unit 1 Assessment: Metric System, Graphing and Motion

Alternate Assessments:

Performance tasks
Project-based assignments
Problem-based assignments
Presentations
Reflective pieces
Concept maps
Case-based scenarios
Portfolios

Benchmark Assessments:

Skills-based assessment
Reading response
Writing prompt
Lab practical

Resources & Materials:

- Cell Phone Apps for video editing
- Chromebooks
- https://sites.google.com/site/delseaphysics1/Home
- Lab Pro Modules and appropriate sensors
- Meter Sticks/metric rules
- Timing Device

Technology:

- Ed Puzzle
- Chromebook
- Class website
- Google Classroom
- Google Suite
- Graphical Analysis Program

- Lab Pro Modules and Sensors
- Other
- Promethean Board

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.C.CS3	Develop cultural understanding and global awareness by engaging with learners of other cultures.
TECH.8.1.12.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.12.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.A.2	Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.