



Sant'Anna American International School

Avenida Independência, 5656
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High School Curriculum

Grades 9-12

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Arts Curriculum

Arts Curriculum

Grades 9-11

Standard 1

9	10	11
<p align="center">Standard 1: Understands and Applies Media, Techniques and Processes</p>	<p align="center">Standard 1: Understands and Applies Media, Techniques and Processes</p>	<p align="center">Standard 1: Understands and Applies Media, Techniques and Processes</p>
<p>9.1.1 Identify, apply and demonstrate appropriate use of various media, techniques and processes to communicate ideas in their work including but not limited to;</p> <p>Drawing: Media: pencil, colored pencil, charcoal, oil pastels, fine line marker Processes: contour line, shading, rendering, value study, crosshatching, stippling, one and two point perspective</p> <p>Painting: Media: acrylic, watercolors, Processes: wet – on - wet, wet – on - dry, Ceramics/ Sculpture: Media: cardboard, paper Process: surface decoration, addition/ subtraction, construction</p> <p>Mixed Media: Media: tissue paper, newspaper, magazines, recyclables, Process: collage, decoupage</p> <p>New Media: Media: Computers Processes: computer software, internet</p>	<p>10.1.1 Identify, apply and demonstrate appropriate use of various media, techniques and processes to communicate ideas in their work including but not limited to;</p> <p>Drawing: Media: pencil, colored pencil, charcoal, oil pastels, fine line marker Processes: contour line, shading, rendering, value study, crosshatching, stippling, one and two point perspective</p> <p>Painting: Media: acrylic, watercolors Processes: wet – on - wet, wet – on - dry, masking Ceramics/ Sculpture: Media: cardboard, paper Process: surface decoration, addition/ subtraction, construction</p> <p>Mixed Media: Media: tissue paper, newspaper, magazines, recyclables, Process: collage, decoupage</p> <p>New Media: Media: Computers Processes: computer software, internet</p>	<p>11.1.1 Identify, apply and demonstrate appropriate use of various media, techniques and processes to communicate ideas in their work with in the given AP category including but not limited to;</p> <p>Drawing: Media: pencil, colored pencil, charcoal, oil pastels, fine line marker Processes: contour line, shading, rendering, value study, crosshatching, stippling</p> <p>Painting: Media: acrylic, watercolors Processes: wet – on - wet, wet – on -dry, masking Ceramics/ Sculpture: Media: cardboard, paper Process: surface decoration, addition/ subtraction, construction</p> <p>Mixed Media: Media: tissue paper, newspaper, magazines, recyclables, Process: collage, decoupage</p> <p>New Media: Media: Computers Processes: computer software, internet</p>

Standard 2

9	10	11
Standard 2: Uses Knowledge of Structures and Functions	Standard 2: Uses Knowledge of Structures and Functions	Standard 2: Uses Knowledge of Structures and Functions
<p>9.2.1 Identify and apply the elements (line, space, shape, color, texture, form and value) and principles (composition, movement, rhythm, balance, emphasis, unity, proportion, pattern and contrast) through their work that effectively communicates their ideas.</p> <p>9.2.2 Identify and discriminate between colors (primary, secondary, tertiary, warm, cool, analogous, complementary, intermediate, neutral, tint, tones, shades, and value), lines (characteristics, quality), textures (tactile and visual), space (foreground, middle ground, background, placement, one, two and three point perspective, overlapping, negative, size), balance (symmetrical, asymmetrical, radial), the use of proportion, rhythm, variety, repetition, and movement in their work and the work of others.</p> <p>9.2.3 Identify and apply the elements and principles and use them in various combinations within an assignment and with the guidance of the instructor.</p>	<p>10.2.1 Identify and apply the elements (line, space, shape, color, texture, form and value) and principles (composition, movement, rhythm, balance, emphasis, unity, proportion, pattern and contrast) through their work that effectively communicates their ideas.</p> <p>10.2.2 Identify and discriminate between colors (primary, secondary, tertiary, warm, cool, analogous, complementary, intermediate, neutral, tint, tones, shades, and value), lines (characteristics, quality), textures (tactile and visual), space (foreground, middle ground, background, placement, one, two and three point perspective, overlapping, negative, size), balance (symmetrical, asymmetrical, radial), the use of proportion, rhythm, variety, repetition, and movement in their work and the work of others.</p> <p>10.2.3 Identify and apply the elements and principles and use them in various combinations independently with the guidance of the instructor .</p>	<p>11.2.1 Identify and apply the elements (line, space, shape, color, texture, form and value) and principles (composition, movement, rhythm, balance, emphasis, unity, proportion, pattern and contrast) through their work that effectively communicates their ideas.</p> <p>11.2.2 Identify, discriminate and properly utilize color (primary, secondary, tertiary, warm, cool, analogous, complementary, intermediate, neutral, tint, tones, shades, and value), line (characteristics, quality), texture (tactile and visual), space (foreground, middle ground, background, placement, one, two and three point perspective, overlapping, negative, size), balance (symmetrical, asymmetrical, radial), the use of proportion, rhythm, variety, repetition, and movement in their work and the work of others.</p> <p>11.2.3 Identify and apply the elements and principles and use them in various combinations independently with the guidance of the instructor</p>

Standard 3

9	10	11
Standard 3: Chooses and Evaluates A Range of Subject Matter, Symbols, and Ideas	Standard 3: Chooses and Evaluates A Range of Subject Matter, Symbols, and Ideas	Standard 3: Chooses and Evaluates A Range of Subject Matter, Symbols, and Ideas
<p>9.3.1 Create works of art base on sensitive observation from real life and personal experience and demonstrate refined observation skills.</p> <p>9.3.2 Demonstrate ability to utilize personal interests, current events, experiences, imagery, media or methods as sources for expanding their work.</p> <p>9.3.3 Utilize themes and symbols that demonstrate knowledge of context, values and aesthetics to communicate intended meaning in their work.</p>	<p>10.3.1 Create works of art base on sensitive observation from real life and personal experience and demonstrate refined observation skills.</p> <p>10.3.2 Demonstrate ability to utilize personal interests, current events, experiences, imagery, media or methods as sources for expanding their work.</p> <p>10.3.3 Utilize themes and symbols that demonstrate knowledge of context, values and aesthetics to communicate intended meaning in their work.</p>	<p>11.3.1 Create works of art base on sensitive observation from real life and personal experience and demonstrate refined observation skills</p> <p>11.3.2 Demonstrate ability to utilize personal interests, current events, experiences, imagery, media or methods as sources for expanding their work.</p> <p>11.3.3 Utilize themes and symbols that demonstrate knowledge of context, values and aesthetics to communicate intended meaning in their work.</p> <p>11.3.4 Create a portfolio that demonstrates breadth and depth or idea, technique and subject</p> <p>11.3.5 Develop a concentration series within their portfolio which show the develop of a concept, technique and/ or subject</p>

Standard 4

9	10	11
Standard 4: Understands the visual Arts in Relation to History and Culture	Standard 4: Understands the visual Arts in Relation to History and Culture	Standard 4: Understands the visual Arts in Relation to History and Culture
<p>9.4.1 Research and compare works of art to identify similarities and differences in function or process</p> <p>9.4.2 Identify how the culture of artists is reflected in their work.</p> <p>9.4.3 Identify and analyze a variety of work via culture, style and aspects of historical context.</p> <p>9.4.4 Identify common stylistic features from art of various cultures or time periods.</p>	<p>10.4.1 Research and compare works of art to identify similarities and differences in function or process</p> <p>10.4.2 Identify how the culture of artists is reflected in their work</p> <p>10.4.3 Identify and analyze a variety of work via culture, style and aspects of historical context</p> <p>10.4.4 Identify common stylistic features from art of various cultures or time periods</p>	<p>11.4.1 Research and compare works of art to identify similarities and differences in function or process within the classroom and outside of classroom.</p> <p>11.4.2 Identify how the culture of artists is reflected in their work and analyze how culture is reflected in own work</p> <p>11.4.3 Identify and analyze a variety of work via culture, style and aspects of historical context</p> <p>11.4.4 Identify common stylistic features from art of various cultures or time periods and compare to own concentration</p>

Standard 5

9	10	11
Standard 5: Reflects Upon and Assesses the Characteristics and Merits of Their Artwork and the Artwork of Others	Standard 5: Reflects Upon and Assesses the Characteristics and Merits of Their Artwork and the Artwork of Others	Standard 5: Reflects Upon and Assesses the Characteristics and Merits of Their Artwork and the Artwork of Others
9.5.1 Expand use of appropriate art vocabulary. 9.5.2 Demonstrate evidence of reflection, thoughtfulness and care in the completion of work. 9.5.3 Establish criteria for critiquing excellence in work revising and refining through analysis, peer critique, self – evaluation both verbal and written. 9.5.4 Demonstrate respect for their work and the work of others.	10.5.1 Expand and develop use of appropriate art vocabulary. 10.5.2 Demonstrate evidence of reflection, thoughtfulness and care in the completion of work. 10.5.3 Establish and utilize criteria for critiquing excellence in work revising and refining through analysis, peer critique, one – on – one instructor critique, self – evaluation both verbal and written. 10.5.4 Demonstrate respect for their work and the work of others	11.5.1 Expand and develop use of appropriate art vocabulary. 11.5.2 Demonstrate evidence of reflection, thoughtfulness and care in the completion of work and portfolio. 11.5.3 Establish and utilize criteria for critiquing excellence in work revising and refining through analysis, peer critique, one – on – one instructor critique, self – evaluation both verbal and written. 11.5.4 Demonstrate respect for their work and the work of others

Standard 6

9	10	11
Standard 6: Makes Connections Between Visual Arts and Other Disciplines	Standard 6: Makes Connections Between Visual Arts and Other Disciplines	Standard 6: Makes Connections Between Visual Arts and Other Disciplines
<p>9.6.1 Identify and analyze a wide variety of professions related to art such as: advertising, fashion design, landscape designer, architect, industrial design, interior design, web design</p> <p>9.6.2 Examine and critique art at local museums, galleries and exhibitions in community as well as student exhibitions within the school community</p> <p>9.6.3 Examine and critique work of visiting artists and art professionals</p> <p>9.6.4 Identify ways to become actively involved in the arts in the community both in and out of school</p> <p>9.6.5 Create works in collaboration with other departments within the school community</p>	<p>10.6.1 Identify and analyze a wide variety of professions related to art such as: advertising, fashion design, landscape designer, architect, industrial design, interior design, web design</p> <p>10.6.2 Examine and critique art at local museums, galleries and exhibitions in the community as well as student exhibitions within the school community</p> <p>10.6.3 Examine and critique work of visiting artists and art professionals</p> <p>10.6.4 Identify ways to become actively involved in the arts in the community both in and out of school</p> <p>10.6.5 Create works in collaboration with other departments within the school community</p>	<p>11.6.1 Identify and analyze a wide variety of professions related to art such as: advertising, fashion design, landscape designer, architect, industrial design, interior design, web design</p> <p>11.6.2 Examine and critique art at local museums, galleries and exhibitions in the community as well as student exhibitions within the school community</p> <p>11.6.3 Examine and critique work of visiting artists and art professionals</p> <p>11.6.4 Identify ways to become actively involved in the arts in the community both in and out of school</p> <p>11.6.5 Create works in collaboration with other departments within the school community</p>

Performances/Exhibits/Festivals/Competitions for this course/grade level:	Performances/Exhibits/Festivals/Competitions for this course/grade level:	Performances/Exhibits/Festivals/Competitions for this course/grade level:
The work from this course will be displayed at both the end of year art show as well as individual displays throughout the year.	The work from this course will be displayed at both the end of year art shows as well as individual displays throughout the year.	Each student is required to prepare individual exhibitions for the end of the year art show as well as an exhibition outside of school. Work will be displayed periodically throughout the year as well.



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Biology Curriculum

Overview

The biology curriculum is designed to continue student investigations and deepen student understanding of the biological sciences. High school instruction should include concepts introduced in grades K-8 at a more abstract level. In-depth study of the following concepts is included: the cell, the molecular basis of heredity, biological evolution, the interdependence of organisms, matter, energy and organization in living systems, and the adaptive responses of organisms.

Unifying Concepts

Unifying Concepts should unite the study of various biological topics across grade levels. Focus on the unifying concepts of science will also help students to understand the constant nature of science across disciplines and time even as scientific knowledge, understanding and procedures change:

1. Systems, Order and Organization.
2. Evidence, Models, and Explanation.
3. Constancy, Change, and Measurement.
4. Evolution and Equilibrium.
5. Form and Function.

STANDARD I: Students will understand that living organisms interact with one another and their environment.

Benchmark	Skills
<p>1. Ecosystems are shaped by interactions among living organisms and their physical environment. Ecosystems change constantly, either staying in a state of dynamic balance or shifting to a new state of balance. Matter cycles in ecosystems, and energy flows from outside sources through the system. Humans are part of ecosystems and can deliberately or inadvertently alter an ecosystem.</p>	<p>a) Summarize how energy flows through an ecosystem. b) Arrange components of a food chain according to energy flow. c) Compare the quantity of energy in the steps of an energy pyramid. d) Describe strategies used by organisms to balance the energy expended to obtain food to the energy gained from the food (e.g., migration to areas of seasonal abundance, switching type of prey based upon availability, hibernation or dormancy).</p>
	<p>a) Explain relationships between matter cycles and organisms. b) Use diagrams to trace the movement of matter through a cycle (i.e., carbon, oxygen, nitrogen, water) in a variety of biological communities and ecosystems. c) Explain how water is a limiting factor in various ecosystems. d) Distinguish between inference and evidence in a newspaper, magazine, journal, or Internet article that addresses an issue related to human impact on cycles of matter in an ecosystem and determine the bias in the article. e) Evaluate the impact of personal choices in relation to the cycling of matter within an ecosystem (e.g., impact of automobiles on the carbon cycle, impact on landfills of processed and packaged foods).</p>
	<p>a) Describe how interactions among organisms and their environment help shape ecosystems. b) Categorize relationships among living things according to predator-prey, competition, and symbiosis. c) Formulate and test a hypothesis specific to the effect of changing one variable upon another in a small ecosystem. d) Use data to interpret interactions among biotic and abiotic factors (e.g., pH, temperature, precipitation, populations, diversity) within an ecosystem. e) Investigate an ecosystem using methods of science to gather quantitative and qualitative data that describe the ecosystem in detail. f) Research and evaluate local and global practices that affect ecosystems.</p>

STANDARD II: Students will understand that all organisms are composed of one or more cells that are made of molecules, come from preexisting cells, and perform life functions

Benchmark	Skills
<p>1. Cells are the basic unit of life. All living things are composed of one or more cells that come from preexisting cells. Cells perform a variety of functions necessary to maintain homeostasis and life. The structure and function of a cell determines the cell's role in an organism. Living cells are composed of chemical elements and molecules that form large, complex molecules. These molecules form the basis for the structure and function of cells.</p>	<p>a) Describe the fundamental chemistry of living cells. b) List the major chemical elements in cells (i.e., carbon, hydrogen, nitrogen, oxygen, phosphorous, sulfur, trace elements). c) Identify the function of the four major macromolecules (i.e., carbohydrates, proteins, lipids, nucleic acids). d) Explain the role of enzymes in cell chemistry.</p>
	<p>a) Describe the flow of energy and matter in cellular function. b) Distinguish between autotrophic and heterotrophic cells. c) Illustrate the cycling of matter and the flow of energy through photosynthesis (e.g., by using light energy to combine CO₂ and H₂O to produce oxygen and sugars) and respiration (e.g., by releasing energy from sugar and O₂ to produce CO₂ and H₂O). d) Measure the production of one or more of the products of either photosynthesis or respiration.</p>
	<p>a) Investigate the structure and function of cells and cell parts. b) Explain how cells divide from existing cells. c) Describe cell theory and relate the nature of science to the development of cell theory (e.g., built upon previous knowledge use of increasingly more sophisticated technology). d) Describe how the transport of materials in and out of cells enables cells to maintain homeostasis (i.e., osmosis, diffusion, active transport). e) Describe the relationship between the organelles in a cell and the functions of that cell. f) Experiment with microorganisms and/or plants to investigate growth and reproduction.</p>

STANDARD III: Students will understand the relationship between structure and function of organs and organ systems.

Benchmark	Skills
<p>1. Structure relates to function. Organs and organ systems function together to provide homeostasis in organisms. The functioning of organs depends upon multiple organ systems.</p>	<ul style="list-style-type: none"> a) Describe the structure and function of organs. b) Diagram and label the structure of the primary components of representative organs in plants and animals (e.g., heart - muscle tissue, valves and chambers; lung - trachea, bronchial, alveoli; leaf - veins, stomata; stem - xylem, phloem, cambium; root - tip, elongation, hairs; skin - layers, sweat glands, oil glands, hair follicles; ovaries - ova, follicles, corpus luteum). c) Describe the function of various organs (e.g. heart, lungs, skin, leaf, stem, root, ovary). d) Relate the structure of organs to the function of organs. e) Compare the structure and function of organs in one organism to the structure and function of organs in another organism. f) Research and report on technological developments related to organs.
	<ul style="list-style-type: none"> a) Describe the relationship between structure and function of organ systems in plants and animals. b) Relate the function of an organ to the function of an organ system. c) Describe the structure and function of various organ systems (i.e., digestion, respiration, circulation, protection and support, nervous) and how these systems contribute to homeostasis of the organism. d) Examine the relationships of organ systems within an organism (e.g., respiration to circulation, leaves to roots) and describe the relationship of structure to function in the relationship. e) Relate the tissues that make up organs to the structure and function of the organ. f) Compare the structure and function of organ systems in one organism to the structure and function in another organism.

STANDARD IV: Students will understand that genetic information coded in DNA is passed from parents to offspring by sexual and asexual reproduction. The basic structure of DNA is the same in all living things. Changes in DNA may alter genetic expression.

Benchmark	Skills
<p>1. Information passed from parent to offspring is coded in DNA (deoxyribonucleic acid) molecules. The fundamental DNA structure is the same for all living things; the sequence of DNA differs between each organism and each species. Changes in the DNA sequence may alter genetic expression. The genetic information in DNA provides the instructions for assembling protein molecules in cells. The code used is virtually the same for all organisms. There are predictable patterns of inheritance. Sexual reproduction increases the genetic variation of a species. Asexual reproduction provides offspring that have the same genetic code as the parent.</p>	<ul style="list-style-type: none"> a) Compare sexual and asexual reproduction. b) Explain the significance of meiosis and fertilization in genetic variation. c) Compare the advantages/disadvantages of sexual and asexual reproduction to survival of species. d) Formulate, defend, and support a perspective of a bioethical issue related to intentional or unintentional chromosomal mutations.
	<ul style="list-style-type: none"> a) Predict and interpret patterns of inheritance in sexually reproducing organisms. b) Explain Mendel’s laws of segregation and independent assortment and their role in genetic inheritance. c) Demonstrate possible results of recombination in sexually reproducing organisms using one or two pairs of contrasting traits in the following crosses: dominance/recessive, incomplete dominance, codominance, and sex-linked traits. d) Relate Mendelian principles to modern-day practice of plant and animal breeding. e) Analyze bioethical issues and consider the role of science in determining public policy.
	<ul style="list-style-type: none"> a) Explain how the structure and replication of DNA are essential to heredity and protein synthesis. b) Use a model to describe the structure of DNA. c) Explain the importance of DNA replication in cell reproduction. d) Summarize how genetic information encoded in DNA provides instructions for assembling protein molecules. e) Describe how mutations may affect genetic expression and cite examples of mutagens. f) Relate the historical events that lead to our present understanding of DNA to the cumulative nature of science knowledge and technology. g) Research, report, and debate genetic technologies that may improve the quality of life (e.g., genetic engineering, cloning, gene splicing).

STANDARD V: Students will understand that biological diversity is a result of evolutionary processes.

Benchmark	Skills
<p>1. Evolution is central to modern science’s understanding of the living world. The basic idea of biological evolution is that Earth’s present day species developed from earlier species. Evolutionary processes allow some species to survive with little or no change, some to die out altogether, and other species to change, giving rise to a greater diversity of species. Science distinguishes itself from other ways of knowing and from other bodies of knowledge through the use of empirical standards, logical arguments, and skepticism, as science strives for explanations of the world.</p>	<ul style="list-style-type: none"> a) Relate principles of evolution to biological diversity. b) Describe the effects of environmental factors on natural selection. c) Relate genetic variability to a species’ potential for adaptation to a changing environment. d) Relate reproductive isolation to speciation. e) Compare selective breeding to natural selection and relate the differences to agricultural practices.
	<ul style="list-style-type: none"> a) Cite evidence for changes in populations over time and use concepts of evolution to explain these changes. b) Cite evidence that supports biological evolution over time (e.g., geologic and fossil records, chemical mechanisms, DNA structural similarities, homologous and vestigial structures). c) Identify the role of mutation and recombination in evolution. d) Relate the nature of science to the historical development of the theory of evolution. e) Distinguish between observations and inferences in making interpretations related to evolution (e.g., observed similarities and differences in the beaks of Galapagos finches leads to the inference that they evolved from a common ancestor; observed similarities and differences in the structures of birds and reptiles leads to the inference that birds evolved from reptiles). f) Review a scientific article and identify the research methods used to gather evidence that documents the evolution of a species.
	<ul style="list-style-type: none"> a) Classify organisms into a hierarchy of groups based on similarities that reflect their evolutionary relationships. b) Classify organisms using a classification tool such as a key or field guide. c) Generalize criteria used for classification of organisms (e.g., dichotomy, structure, broad to specific). d) Explain how evolutionary relationships are related to classification systems. e) Justify the ongoing changes to classification schemes used in biology.



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Chemistry Curriculum

Grade 10

The proposed curriculum is designed to help and guide teachers regarding specific chemistry content to be taught in high school.

In high school, students develop greater independence in designing and carrying out experiments, most often working alone or in small groups. They come up with questions and hypotheses that build on what they have learned from secondary sources. They learn to critique and defend their findings, and to revise their explanations of phenomena as new findings emerge. Their facility with using a variety of physical and conceptual models increases. Students in the final two years of high school can be encouraged to carry out extended independent experiments that explore a scientific hypothesis in depth, sometimes with the assistance of a scientific mentor from outside the school setting.

Strand 1: Content Standards

Benchmarks	Skills
<p>1. Properties of Matter</p>	<p>a) Identify and explain physical properties (e.g., density, melting point, boiling point, conductivity, malleability) and chemical properties (e.g., the ability to form new substances). Distinguish between chemical and physical changes.</p> <p>b) Explain the difference between pure substances (elements and compounds) and mixtures. Differentiate between heterogeneous and homogeneous mixtures.</p> <p>c) Describe the three normal states of matter (solid, liquid, gas) in terms of energy, particle motion, and phase transitions.</p>
<p>2. Atomic Structure and Nuclear Chemistry</p>	<p>a) Recognize discoveries from Dalton (atomic theory), Thomson (the electron), Rutherford (the nucleus), and Bohr (planetary model of atom), and understand how each discovery leads to modern theory.</p> <p>b) Describe Rutherford’s “gold foil” experiment that led to the discovery of the nuclear atom. Identify the major components (protons, neutrons, and electrons) of the nuclear atom and explain how they interact.</p> <p>c) Interpret and apply the laws of conservation of mass, constant composition (definite proportions), and multiple proportions.</p> <p>d) Write the electron configurations for the first twenty elements of the periodic table.</p> <p>e) Identify the three main types of radioactive decay (alpha, beta, and gamma) and compare their properties (composition, mass, charge, and penetrating power).</p> <p>f) Describe the process of radioactive decay by using nuclear equations, and explain the concept of half-life for an isotope (for example, C-14 is a powerful tool in determining the age of objects).</p> <p>g) Compare and contrast nuclear fission and nuclear fusion.</p>
<p>3. Periodicity</p>	<p>a) Explain the relationship of an element’s position on the periodic table to its atomic number. Identify families (groups) and periods on the periodic table.</p> <p>b) Use the periodic table to identify the three classes of elements: metals, nonmetals, and metalloids.</p> <p>c) Relate the position of an element on the periodic table to its electron configuration and compare its reactivity to the reactivity of other elements in the table.</p> <p>d) Identify trends on the periodic table (ionization energy, electronegativity, and relative sizes of atoms and ions).</p>

<p>4. Chemical Bonding</p>	<ul style="list-style-type: none"> a) Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons. b) Draw Lewis dot structures for simple molecules and ionic compounds. c) Use electronegativity to explain the difference between polar and nonpolar covalent bonds. d) Use valence-shell electron-pair repulsion theory (VSEPR) to predict the molecular geometry (linear, trigonal planar, and tetrahedral) of simple molecules. e) Identify how hydrogen bonding in water affects a variety of physical, chemical, and biological phenomena (e.g., surface tension, capillary action, density, boiling point). f) Name and write the chemical formulas for simple ionic and molecular compounds, including those that contain the polyatomic ions: ammonium, carbonate, hydroxide, nitrate, phosphate, and sulfate
<p>5. Chemical Reactions and Stoichiometry</p>	<ul style="list-style-type: none"> a) Balance chemical equations by applying the laws of conservation of mass and constant composition (definite proportions). b) Classify chemical reactions as synthesis (combination), decomposition, single displacement (replacement), double displacement, and combustion. c) Use the mole concept to determine number of particles and molar mass for elements and compounds. Determine percent compositions, empirical formulas, and molecular formulas. d) Calculate the mass-to-mass stoichiometry for a chemical reaction. e) Calculate percent yield in a chemical reaction.
<p>6. States of Matter, Kinetic Molecular Theory, and Thermochemistry</p>	<ul style="list-style-type: none"> a) Using the kinetic molecular theory, explain the behavior of gases and the relationship between pressure and volume (Boyle's law), volume and temperature (Charles's law), pressure and temperature (Gay-Lussac's law), and the number of particles in a gas sample (Avogadro's hypothesis). Use the combined gas law to determine changes in pressure, volume, and temperature. b) Perform calculations using the ideal gas law. Understand the molar volume at 273 K and 1 atmosphere (STP). c) Using the kinetic molecular theory, describe and contrast the properties of gases, liquids, and solids. Explain, at the molecular level, the behavior of matter as it undergoes phase transitions. d) Describe the law of conservation of energy. Explain the difference between an endothermic process and an exothermic process. e) Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy).

<p>7. Solutions, Rates of Reaction, and Equilibrium</p>	<ul style="list-style-type: none"> a) Describe the process by which solutes dissolve in solvents. b) Calculate concentration in terms of molarity. Use molarity to perform solution dilution and solution stoichiometry. c) Identify and explain the factors that affect the rate of dissolving (e.g., temperature, concentration, surface area, pressure, mixing). d) Compare and contrast qualitatively the properties of solutions and pure solvents (colligative properties such as boiling point and freezing point). e) Identify the factors that affect the rate of a chemical reaction (temperature, mixing, concentration, particle size, surface area, catalyst). f) Predict the shift in equilibrium when a system is subjected to a stress (LeChatelier's principle) and identify the factors that can cause a shift in equilibrium (concentration, pressure, volume, temperature).
<p>8. Acids and Bases and Oxidation-Reduction Reactions</p>	<ul style="list-style-type: none"> a) Define the Arrhenius theory of acids and bases in terms of the presence of hydronium and hydroxide ions in water and the Bronsted-Lowry theory of acids and bases in terms of proton donors and acceptors. b) Relate hydrogen ion concentrations to the pH scale and to acidic, basic, and neutral solutions. Compare and contrast the strengths of various common acids and bases (e.g., vinegar, baking soda, soap, citrus juice). c) Explain how a buffer works. d) Describe oxidation and reduction reactions and give some everyday examples, such as fuel burning and corrosion. Assign oxidation numbers in a reaction.

Strand 2: Scientific Inquiry Skills Standards

<p>1. Make observations, raise questions, and formulate hypotheses</p>	<p>a) Observe the world from a scientific perspective. b) Pose questions and form hypotheses based on personal observations, scientific articles, experiments, and knowledge. c) Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories.</p>
<p>2. Design and conduct scientific investigations</p>	<p>a) Articulate and explain the major concepts being investigated and the purpose of an investigation. b) Select required materials, equipment, and conditions for conducting an experiment. c) Identify independent and dependent variables. d) Write procedures that are clear and replicable. e) Employ appropriate methods for accurately and consistently</p> <ul style="list-style-type: none">• making observations• making and recording measurements at appropriate levels of precision• collecting data or evidence in an organized way <p>f) Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration (if required), technique, maintenance, and storage. g) Follow safety guidelines.</p>
<p>3. Analyze and interpret results of scientific investigations</p>	<p>a) Present relationships between and among variables in appropriate forms.</p> <ul style="list-style-type: none">• Represent data and relationships between and among variables in charts and graphs.• Use appropriate technology (e.g., graphing software) and other tools. <p>b) Use mathematical operations to analyze and interpret data results. c) Assess the reliability of data and identify reasons for inconsistent results, such as sources of error or uncontrolled conditions. d) Use results of an experiment to develop a conclusion to an investigation that addresses the initial questions and supports or refutes the stated hypothesis. e) State questions raised by an experiment that may require further investigation.</p>



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Global Citizenship

Grades 9-12

Strand 1: KNOWLEDGE AND UNDERSTANDING

Standard: Students will understand the wider and diverse world, interdependence of countries, social differences, and their role as a world citizen.

Benchmarks	Skills
1. Demonstrate understanding of <i>social justice and equity</i> .	a) Recognize causes for inequalities within and between societies. b) Acknowledge the complexity of global issues and understand their role as Global Citizen.
2. Understand how <i>globalization and interdependence</i> make the world small.	a) Demonstrate awareness of different economic and political systems. b) Demonstrate awareness of ethical consumerism and lifestyles that contribute for a sustainable world.
3. Recognize the benefits of <i>peace</i> and the impact of <i>conflict</i> .	a) Identify causes and impact of conflict at a global level. b) Identify conditions conducive to peace or conflict.

Strand 2: SKILLS

Standard: Students will develop critical thinking and ability to express a view about complex global issues, and will respect and value people and things.

Benchmarks	Skills
1. Use <i>critical thinking</i> to develop opinion.	a) Assess different viewpoints for making ethical judgments. b) Demonstrate media literacy.
2. Demonstrate <i>ability to express a view</i> .	a) Demonstrate ability to develop/change position through reasoned argument. b) Demonstrate ability to argue rationally and persuasively from an informed position.
3. Demonstrate <i>respect for people and things</i> .	a) Demonstrate acceptance of group decisions. b) Demonstrate ability to negotiate, mediate, and compromise. c) Understand the importance of following a personal lifestyle for a sustainable world.

Strand 3: VALUES AND ATTITUDES

Standard: Students will understand the importance of contributing to the community at a range of levels from local to global, and will value and respect diversity.

Benchmarks	Skills
1. Demonstrate commitment to <i>social justice and equity</i> .	a) Demonstrate a concern for injustice and inequality. b) Demonstrate growing interest in world events.
2. Demonstrate <i>value and respect for diversity</i> .	a) Demonstrate willingness to learn from the experience of others. b) Demonstrate an understanding and respect for difference of opinions.
3. Demonstrate <i>concern for the environment and commitment to sustainable development</i> .	a) Demonstrate willingness to care for objects and the environment. b) Demonstrate responsibility for the use of resources.
4. Demonstrate <i>belief that people can make a difference</i> .	a) Demonstrate willingness to co-operate and participate. b) Demonstrate willingness to take a stand on local and global issues.



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Graphic Design / Yearbook Curriculum High School

Overview

The term graphic design can refer to a number of artistic and professional disciplines which focus on visual communication and presentation. Various methods are used to create and combine symbols, images and/or words to create a visual representation of ideas and messages. A graphic designer may use typography, visual arts and page layout techniques to produce the final result. Graphic design often refers to both the process (designing) by which the communication is created and the products (designs) which are generated.

The objective of the Graphic Design course is to create communication pieces that are visually correct and that can send a message to the desired public or target audience. This course will focus on the creation of Vector Art objects using Adobe Illustrator, create, edit and change Raster Objects using advanced features of Adobe Photoshop, and also focus on the main points that make a layout or an art piece become a success. Finally, this course focus on the theory of design and involves many hands-on practice using the correct tools for each layout.

Pre-requisite: None

Strand 1: INTRODUCTION TO GRAPHIC DESIGN

Standard: Students will understand the basic concepts of creating sophisticated layouts visually correct.

Benchmarks	Skills
1. Start Up Basics	<ul style="list-style-type: none"> a) History of Graphic Design b) Graphic Styles c) Three-step creation process (Thumbnails, Comps, Final Piece) d) Difference between Art and Design e) Understand Target Audience
2. Visual Hierarchy, and correct use of Graphic Styles	<ul style="list-style-type: none"> a) Understand Visual Hierarchy b) Understand Color Schemes c) Understand the Grid System d) Alignment and organization of layouts
3. Typography	<ul style="list-style-type: none"> a) San-serif typefaces b) Serif typefaces c) Script typefaces d) Concept of designing with text
4. Resolution, file types, and color types.	<ul style="list-style-type: none"> a) Understand display and print resolution b) CMYK Color c) RGB Color d) Vector Art vs. Raster Art

Strand 2: INTRODUCTION TO ADOBE ILLUSTRATOR

Standard: Students will understand the use of vector art programs.

Benchmarks	Skills
1. Illustrator basics	<ul style="list-style-type: none">a) Vector art in Illustratorb) Understand Pathc) Understand Stroke vs. Filld) Illustrator Palette Worke) Organizing the workspacef) Creating new filesg) Illustrator file formatsh) Document Set Up
2. Illustrator Tools	<ul style="list-style-type: none">a) Selection Toolb) Pen Toolc) Gradient Toold) Shape Toole) Line Toolf) Pencil Toolg) Type Tool
3. Illustrator Palettes	<ul style="list-style-type: none">a) Color Paletteb) Character, and Paragraph Palettec) Pathfinder, Transform, and Align Palettesd) Layers Palettee) Stroke, Transparency, and Gradient Palettesf) Symbols Palette

Strand 3: INTRODUCTION TO ADOBE PHOTOSHOP**Standard:** Students will understand the use of raster art programs.

Benchmarks	Skills
1. Photoshop basics	a) Raster art in Photoshop b) Photoshop Layers c) Creating New Files d) Understand DPI (Dots per Inch) e) Color Mode in Photoshop
2. Photoshop Tools	a) Selection Tool b) Healing and Stamp Tools c) Crop Tool d) Magic Wand Tool e) Shape Tools f) Blur, Smudge, and Sharpen Tools g) Type Tool h) History in Photoshop i) Working with Brushes (Creating, editing, and using brushes)
3. Photoshop Palettes	a) Color Palette b) Character, and Paragraph Palette c) Layers and Channels Palette d) Stroke, Transparency, and Gradient Palettes e) Brushes Palette f) Organizing Palettes and the workspace
4. Photoshop Techniques	a) Using Layer Effects b) Understand and use filters in Design c) Color Hue, and Saturation d) Brightness and Contrast e) Levels, and Curves

Strand 4: INTRODUCTION TO ADOBE INDESIGN**Standard:** Students will understand the use of page layout programs.

Benchmarks	Skills
1. Page Layout Basics	a) How to paginate designs. b) Master Pages c) Additional Pages d) Organization of Pages and Book Flow
2. Boxes and Fields	a) Inserting Text Fields b) Inserting Images c) Organizing Booklets d) Paragraph Formatting e) Bonding Boxes f) Hyphenization g) Kerning
3. InDesign Palettes	a) Text Pallete b) Color Pallete c) Pages Pallete d) Organizing the Workspace
4. Design Techniques	a) Using good layout techniques b) Using good color organization c) Importing files from Illustrator d) Importing files from Photoshop e) Exporting files to PDF f) Printing from InDesign



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Language Arts

9th Grade

Vocabulary	Grammar	Writing	Speaking	Literature
<ul style="list-style-type: none"> • analogies • reading comprehension • weekly vocabulary lists <ul style="list-style-type: none"> ○ REP/Success 5-10 words ○ AVG 10-15 words ○ QUEST/ADV 20-25 words ○ Emphasize SAT words • roots, prefixes, & suffixes REP/Success 1-2 <ul style="list-style-type: none"> ○ AVG 2-4· QUEST/ADV 4-6 	<ul style="list-style-type: none"> • Parts of speech (review) • Parts of a sentence • Subject/Verb agreement • Possessives & plurals (rev) • Run-on sentences • Sentence fragments • Sentence Types • Structure & punctuation of simple & compound sentences 	<ul style="list-style-type: none"> • Paragraphs <ul style="list-style-type: none"> ○ Descriptive ○ Fact/Example ○ Comparison/Contrast • Narrative with correctly punctuated dialogue • Essay <ul style="list-style-type: none"> ○ Structure ○ Thesis Statements ○ Supporting Details • Persuasive Essay 	<ul style="list-style-type: none"> • Propaganda • Class discussion • Oral presentation 	<ul style="list-style-type: none"> • short story <ul style="list-style-type: none"> ○ Elements of fiction • drama <i>Romeo & Juliet</i> <ul style="list-style-type: none"> ○ Elements ○ Shakespearean • non-fiction <i>Hiroshima, My Life & Hard Times</i>, or selections from text • novel (see list) • poetry <i>The Odyssey</i> • Epic, myth, & legend
Novels	Success	Average	ADV/Quest	Summer
	<p>The Outsiders And/or any novel from the average list</p>	<ul style="list-style-type: none"> • The Pearl • When the Legends Die Z for Zachariah Night Hiroshima 	<ul style="list-style-type: none"> • Great Expectations • Lord of the Flies • The Odyssey Silas Mariner Ethan Frome A Tale of Two Cities 	<p>I Am the Cheese Treasure Island I Heard the Owl Call The Door Near Here The Hobbit The Time Machine</p>

10th Grade

Vocabulary	Grammar	Writing	Speaking	Literature
<ul style="list-style-type: none"> ● analogies ● weekly vocabulary lists <ul style="list-style-type: none"> ○ AVG 10-15 words ○ QUEST/ADV 20-25 words ○ Emphasize SAT words ● roots, prefixes, & suffixes <ul style="list-style-type: none"> ○ AVG 2-4 ○ QUEST/ADV 4-6 	<ul style="list-style-type: none"> ● verbals ● comma usage (review) ● comma splice ● pronoun usage ● compound & compound/complex sentences <ul style="list-style-type: none"> ○ Identification, structure, & punctuation ○ Clauses ○ Sentence diagramming 	<ul style="list-style-type: none"> ● Descriptive Essay ● Expository Essay ● Persuasive Essay (G.H.S.G.T format) ● Research Paper (M.L.A. format) 	<ul style="list-style-type: none"> ● Class discussion ● Oral presentation 	<ul style="list-style-type: none"> ● Poetry ● Renaissance Drama <ul style="list-style-type: none"> ○ Midsummer's Night Dream ○ Taming of the Shrew ○ Julius Caesar ● Classical Drama <ul style="list-style-type: none"> ○ Antigone (ave. & adv.) ○ Oedipus Rex (quest)
Novels		Average	ADV/Quest	Summer
		<ul style="list-style-type: none"> ● The Old Man & the Sea ● A Separate Peace ● Things Fall Apart ● To Kill a Mockingbird ● Fahrenheit 451 	<ul style="list-style-type: none"> ● All the King's Men 1984 ● The Grapes of Wrath ● The Bluest Eye ● Mythology (novels from the average list may be used also) 	<ul style="list-style-type: none"> ● All Creatures Great & Small ● The Water is Wide ● The Joy Luck Club ● Cold Sassy Tree ● 20,000 Leagues Under the Sea ● The House on Mango Street

11th Grade

Vocabulary	Grammar	Writing	Speaking	Literature
<ul style="list-style-type: none"> ● Analogies ● Weekly vocabulary lists <ul style="list-style-type: none"> ○ AVG 10-15 words ○ QUEST/ADV 20-25 words ● Roots, prefixes, & suffixes <ul style="list-style-type: none"> ○ AVG 2-4 ○ QUEST/ADV 4-6 	<ul style="list-style-type: none"> ● Parallelism ● Verbals ● Clauses ● Pronoun/antecedent agreement ● Clear sentences punctuation (review) 	<ul style="list-style-type: none"> ● Persuasive Essay (G.H.S.G.T format) ● Cause/Effect Essay ● Comparison/Contrast Essay ● Documented literary analysis essay <p>Business/Friendly Letters</p>	<ul style="list-style-type: none"> ● Class discussion ● Oral presentations using technology 	<ul style="list-style-type: none"> ● Periods of American Literature <ul style="list-style-type: none"> ○ Colonial ○ Revolutionary ○ Romanticism & the American Renaissance ○ Civil War/Post-War ○ Rise of Modernism ● American Drama ● American Novel
Novels:	Applied/General	College prep	A.P./Quest	Summer
	<ul style="list-style-type: none"> ● The Red Badge of Courage ● The Great Gatsby ● The Scarlet Letter ● A Raisin in the Sun ● Go Tell It On the Mountain 	<ul style="list-style-type: none"> ● The Scarlet Letter ● The Great Gatsby ● A Farewell to Arms ● The Adventures of Huckleberry Finn ● Jubilee ● Death of a Salesman ● The Crucible 	<ul style="list-style-type: none"> ● The Scarlet Letter ● The Great Gatsby ● The Crucible ● Their Eyes Were Watching God ● A Streetcar Named Desire ● Billy Budd 	<ul style="list-style-type: none"> ● To Sir With Love ● Daisy Miller ● The Adventures of Tom Sawyer ● The Hunt for Red October ● A Lesson Before Dying ● As I Lay Dying ● The Fellowship of the Ring

12th Grade

Vocabulary	Grammar	Writing	Speaking	Literature
<ul style="list-style-type: none"> • analogies • vocabulary from literature <p style="margin-left: 20px;">roots, prefixes, & suffixes (review)</p>	<ul style="list-style-type: none"> • verb choice & tense • parallel structure subordination • levels of usage • sentence structure, variety, & emphasis • grammar, usage, & mechanics (review) 	<ul style="list-style-type: none"> • Personal Narrative • Argumentative Essay • Classification Essay • Documented Literary Analysis Essay • Other: <ul style="list-style-type: none"> ○ Connotation ○ Denotation ○ Generalization 	<ul style="list-style-type: none"> • Class discussion • Oral presentations using technology 	<ul style="list-style-type: none"> • Periods of British Literature <ul style="list-style-type: none"> ○ Anglo-Saxon ○ Medieval ○ Renaissance ○ 17th century ○ 18th century ○ Romantic ○ Victorian Era ○ 20th century • Shakespearean Drama • British Novel (see list)
Novels:	Applied/General	College prep	A.P./Quest	Summer
	<p>1984</p> <p>Lord of the Flies</p> <p>The Time Machine</p> <p>The Importance of Being Ernest</p>	<ul style="list-style-type: none"> • Wuthering Heights Return of the Native Tess of the D'ubervilles Heart of Darkness Invisible Man The Time Machine The Importance of Being Ernest Hamlet 	<p>The Inferno</p> <p>A Man For All Seasons</p> <p>Madame Bovary</p> <p>Portrait of the Artist...</p> <p>Lord Jim</p> <p>Dr. Faustus</p> <p>Things Fall Apart</p> <p>Paradise Lost</p> <p>Murder in the Cathedral</p> <p>Pride & Prejudice</p>	<p>Jane Eyre</p> <p>The Firm</p> <p>Frankenstein</p> <p>The Pillars of the Earth</p> <p>The Awakening</p> <p>The Count of Monte Cristo</p> <p>Sense and Sensibility</p> <p>Brave New World</p> <p>Patriot Games</p>



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Mathematics

Grade 9-12

Strand 1: ALGEBRA, FUNCTIONS, AND GRAPHS

Standard: Students will understand algebraic concepts and applications.

Benchmarks	Skills
<p>1. Represent and analyze mathematical situations and structures using algebraic symbols.</p>	<p>a) Classify numbers and members of the following sets: natural / whole / integers / rationals / irrationals</p> <p>b) Simplify numerical expressions using the order of operations, including exponents.</p> <p>c) Evaluate the numerical value of expressions of one or more variables that are: polynomial / rational / radical</p> <p>d) Simplify algebraic monomial expressions raised to a power (e.g., $[5xy^2]^3$) and algebraic binomial (e.g., $[5x^2 + y]^2$) expressions raised to a power.</p> <p>e) Compare and order polynomial expressions by degree.</p> <p>f) Represent and analyze relationships using written and verbal expressions, tables, equations, and graphs, and describe the connections among those representations:</p> <ul style="list-style-type: none">• translate from verbal expression to algebraic formulae (e.g., “Set up the equations that represent the data in the following equation: John’s father is 23 years older than John. John is 4 years older than his sister Jane. John’s mother is 3 years younger than John’s father. John’s mother is 9 times as old as Jane. How old are John, Jane, John’s mother, and John’s father?”)• given data in a table, construct a function that represents these data (linear only)• given a graph, construct a function that represents the graph (linear only). <p>g) Know, explain, and use equivalent representations for the same real number including: integers / decimals / percents / ratios / scientific notation numbers with integer exponents / inverses (reciprocal) / prime factoring</p> <p>h) Simplify algebraic expressions using the distributive property.</p> <p>i) Explain and use the concept of absolute value.</p> <p>j) Know, explain, and use equivalent representations for algebraic expressions.</p> <p>k) Simplify square roots and cube roots with monomial radicands that are perfect squares or perfect cubes (e.g., $9a^2x^3$).</p> <p>l) Calculate powers and roots of real numbers, both rational and irrational.</p> <p>m) Solve formulas for specified variables and radical equations involving one radical.</p> <p>n) Factor polynomials, difference of squares and perfect square trinomials, and the sum and difference of cubes.</p> <p>o) Simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.</p> <p>p) Manipulate simple expressions with + and – exponents.</p> <p>q) Use the four basic operations (+, -, x, ÷) with: linear expressions / polynomial expressions / rational expressions</p>

<p>2. Understand patterns, relations, functions, and functions.</p>	<ul style="list-style-type: none"> a) Distinguish between the concept of a relation and a function. b) Determine whether a relation defined by a graph, a set of ordered pairs, a table of values, an equation, or a rule is a function. c) Describe the concept of a graph of a function. d) Translate among tabular, symbolic, and graphical representations of functions. e) Explain and use function notation. f) Determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression. g) Identify the independent and dependent variables from an application problem (e.g., height of a child). h) Describe the concept of a graph of an equation. i) Understand symmetry of graphs. j) Analyze and describe middle and end (asymptotic) behavior of linear, quadratic, and exponential functions, and sketch the graphs of functions. k) Work with composition of functions (e.g., find f of g when $f(x) = 2x - 3$ and $g(x) = 3x - 2$), and find the domain, range, intercepts, zeros, and local maxima or minima of the final function. l) Use the quadratic formula and factoring techniques to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points. m) Apply quadratic equations to physical phenomena (e.g., the motion of an object under the force of gravity).
<p>3. Use mathematical models to represent and understand quantitative relationships.</p>	<ul style="list-style-type: none"> a) Model real-world phenomena using linear and quadratic equations and linear inequalities (e.g., apply algebraic techniques to solve rate problems, work problems, and percent mixture problems; solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest). b) Use a variety of computational methods (e.g., mental arithmetic, paper and pencil, technological tools). c) Express the relationship between two variables using a table with a finite set of values and graph the relationship. d) Express the relationship between two variables using an equation and a graph: <ul style="list-style-type: none"> • graph a linear equation and linear inequality in two variables • solve linear inequalities and equations in one variable • solve systems of linear equations in two variables and graph the solutions • use the graph of a system of equations in two variables to help determine the solution. e) Solve applications involving systems of equations. f) Evaluate numerical and algebraic absolute value expressions. g) Create a linear equation from a table of values containing co-linear data. h) Determine the solution to a system of equations in two variables from a given graph. i) Generate an algebraic sentence to model real-life situations. j) Write an equation of the line that passes through two given points. k) Understand and use such operations as taking the inverse, finding the reciprocal, taking a root, and raising to a fractional power. l) Verify that a point lies on a line, given an equation of the line, and be able to derive linear equations by using the point-slope formula.

4. Analyze changes in various contexts.

- a)** Analyze the effects of parameter changes on these functions:
 - linear (e.g., changes in slope or coefficients)
 - quadratic (e.g., $f[x-a]$ changes coefficients and constants)
 - exponential (e.g., changes caused by increasing $x[x + c]$ or $[a^x]$)
 - polynomial (e.g., changes caused by positive or negative values of a , or in a constant).
- b)** Solve routine two- and three-step problems relating to change using concepts such as:
 - exponents / factoring / ratio / proportion / average / percent
- c)** Calculate the percentage of increase and decrease of a quantity.
- d)** Analyze the general shape of polynomial expressions and equations for different degree polynomials (e.g., positive and negative general shapes for third-, fourth-, and fifth-degree polynomials).
- e)** Estimate the rate of change of a function or equation by finding the slope between two points on the graph.
- f)** Evaluate the estimated rate of change in the context of the problem.
- g)** Know Pascal's triangle and use it to expand binomial expressions that are raised to positive integer powers.

Strand 2: GEOMETRY AND TRIGONOMETRY

Standard: Students will understand geometric concepts and applications.

Benchmarks	Skills
<p>1. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.</p>	<ul style="list-style-type: none">a) Interpret and draw two-dimensional objects and find the area and perimeter of basic figures (e.g., rectangles, circles, triangles, other polygons [e.g., rhombi, parallelograms, trapezoids]).b) Find the area and perimeter of a geometric figure composed of a combination of two or more rectangles, triangles, and/or semicircles with just edges in common.c) Find and use measures of sides and interior and exterior angles of triangles and polygons to classify figures (e.g., scalene, isosceles, and equilateral triangles; rectangles [square and non-square]; other convex polygons).d) Interpret and draw three-dimensional objects and find the surface area and volume of basic figures (e.g., spheres, rectangular solids, prisms, polygonal cones), and calculate the surface areas and volumes of these figures as well as figures constructed from unions of rectangular solids and prisms with faces in common, given the formulas for these figures.e) Demonstrate an understanding of simple aspects of a logical argument:<ul style="list-style-type: none">• identify the hypothesis and conclusion in logical deduction• use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.f) Demonstrate an understanding of inductive and deductive reasoning, explain the difference between inductive and deductive reasoning, and identify and provide examples of each:<ul style="list-style-type: none">• for inductive reasoning, demonstrate understanding that showing a statement is true for a finite number of examples does not show it is true for all cases unless the cases verified are all cases• for deductive reasoning, prove simple theorems.g) Write geometric proofs (including proofs by contradiction), including:<ul style="list-style-type: none">• theorems involving the properties of parallel lines cut by a transversal line and the properties of quadrilaterals• theorems involving complementary, supplementary, and congruent angles• theorems involving congruence and similarity• the Pythagorean theorem (tangram proof).

<p>2. Specify locations and describe spatial relationships using coordinate geometry and other representational systems.</p>	<p>a) Demonstrate understanding of the construction of the coordinate plane, know the names of the origin, coordinate axes and four quadrants, draw and label them correctly, find the coordinates of an indicated point, and plot a point with given coordinates.</p> <p>b) Determine the midpoint and distance between two points within a coordinate system and relate these ideas to geometric figures in the plane (e.g., find the center of a circle given two endpoints of a diameter of the circle).</p> <p>c) Given two linear equations, determine whether the lines are parallel, perpendicular, or coincide.</p> <p>d) Use basic geometric ideas (e.g., the Pythagorean theorem, area, and perimeter of objects) in the context of the Euclidean Plane, calculate the perimeter of a rectangle with integer coordinates and sides parallel to the coordinate axes and with sides not parallel.</p>
<p>3. Apply transformations and use symmetry to analyze mathematical situations.</p>	<p>a) Describe the effect of rigid motions on figures in the coordinate plane and space that include rotations, translations, and reflections:</p> <ul style="list-style-type: none"> ▪ determine whether a given pair of figures on a coordinate plane represents the effect of a translation, reflection, rotation, and/or dilation ▪ sketch the planar figure that is the result of a given transformation of this type. <p>b) Deduce properties of figures using transformations that include translations, rotations, reflections, and dilations in a coordinate system:</p> <ul style="list-style-type: none"> • identify congruency and similarity in terms of transformations • determine the effects of the above transformations on linear and area measurements of the original planar figure.
<p>4. Use visualization, spatial reasoning, and geometric modeling to solve problems.</p>	<p>a) Solve real-world problems using congruence and similarity relationships of triangles (e.g., find the height of a pole given the length of its shadow).</p> <p>b) Solve problems involving complementary, supplementary, and congruent angles.</p> <p>c) Solve problems involving the perimeter, circumference, area, volume, and surface area of common geometric figures (e.g., “How does the surface area change when the height is changed to $3h$? How does the surface area change when the radius is changed to $3r$? How does the surface area change when both h and r are doubled?”).</p> <p>d) Solve problems using the Pythagorean theorem (e.g., “Given the length of a ladder and the distance of the base of the ladder from a wall, determine the distance up the wall to the top of the ladder”).</p> <p>e) Understand and use elementary relationships of basic trigonometric functions defined by the angles of a right triangle (e.g., “What is the radius of a circle with an inscribed regular octagon with the length of each side being exactly 2 feet?”).</p> <p>f) Use trigonometric functions to solve for the length of the second leg of a right triangle given the angles and the length of the first leg. (e.g., “A surveyor determines that the angle subtended by a two-foot stick at right angles to his transit is exactly one degree. What is the distance from the transit to the base of the measuring stick?”).</p> <p>g) Know and use angle and side relationships in problems with special right triangles (e.g., 30-, 45-, 60-, and 90-degree triangles).</p>

Strand 3: DATA ANALYSIS AND PROBABILITY

Standard: Students will understand how to formulate questions, analyze data, and determine probabilities.

Benchmarks	Skills
<p>1. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.</p>	<p>a) Understand the differences between the various methods of data collection.</p> <p>b) Know the characteristics of a well-designed and well-conducted survey:</p> <ul style="list-style-type: none">• differentiate between sampling and census• differentiate between a biased and an unbiased sample. <p>c) Know the characteristics of a well-designed and well-conducted experiment:</p> <ul style="list-style-type: none">• differentiate between an experiment and an observational study• recognize sources of bias in poorly designed experiments. <p>d) Understand the role of randomization in well-designed surveys and experiments.</p>
<p>2. Select and use appropriate statistical methods to analyze data.</p>	<p>a) Understand the meaning of measurement data and categorical data, and of the term “variable.”</p> <p>b) Understand the meaning of “univariate” (i.e., one variable) and “bivariate” (i.e., two variable) data.</p> <p>c) For univariate data, be able to display the distribution and describe its shape using appropriate summary statistics, and understand the distinction between a statistic and a parameter:</p> <ul style="list-style-type: none">• construct and interpret frequency tables, histograms, stem and leaf plots, and box and whisker plots• calculate and apply measures of central tendency (mean, median, and mode) and measures of variability (range, quartiles, standard deviation)• compare distributions of univariate data using back-to-back stem and leaf plots and parallel box and whisker plots. <p>d) For bivariate data, be able to display a scatter plot and describe its shape:</p> <ul style="list-style-type: none">• fit a linear model to a set of data using technological tools• describe and interpret the relationship/correlation between two variables using technological tools.

<p>3. Develop and evaluate inferences and predictions that are based on data.</p>	<p>a) Compare and draw conclusions between two or more sets of univariate data using basic data analysis techniques and summary statistics.</p> <p>b) Draw conclusions concerning the relationships among bivariate data:</p> <ul style="list-style-type: none"> • make predictions from a linear pattern in data • determine the strength of the relationship between two sets of data by examining the correlation • understand that correlation does not imply a cause-and-effect relationship. <p>c) Use simulations to explore the variability of sample statistics from a known population and construct sampling distributions.</p> <p>d) Understand how sample statistics reflect the values of population parameters and use sampling distributions as the basis for informal inference.</p> <p>e) Evaluate published reports that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions.</p>
<p>4. Understand and apply basic concepts of probability.</p>	<p>a) Explain the concept of a random variable.</p> <p>b) Understand the concept of probability as relative frequency.</p> <p>c) Use simulations to compute the expected value and probabilities of random variables in simple cases.</p> <p>d) Distinguish between independent and dependent events.</p> <p>e) Understand how to compute the probability of an event using the basic rules of probability:</p> <ul style="list-style-type: none"> • complement rule • addition rule (disjoint and joint events) • multiplication rule (independent events) • conditional probability.



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Physics Curriculum

STANDARD I: Students will understand how to measure, calculate, and describe the motion of an object in terms of position, time, velocity, and acceleration.

Benchmarks	Skills
<p>1. Describe the motion of an object in terms of position, time, and velocity</p>	<p>a) Calculate the average velocity of a moving object using data obtained from measurements of position of the object at two or more times.</p> <p>b) Distinguish between distance and displacement.</p> <p>c) Distinguish between speed and velocity.</p> <p>d) Determine and compare the average and instantaneous velocity of an object from data showing its position at given times.</p> <p>e) Collect, graph, and interpret data for position vs. time to describe the motion of an object and compare this motion to the motion of another object.</p>
<p>2. Analyze the motion of an object in terms of velocity, time, and acceleration.</p>	<p>a) Determine the average acceleration of an object from data showing velocity at given times.</p> <p>b) Describe the velocity of an object when its acceleration is zero.</p> <p>c) Collect, graph, and interpret data for velocity vs. time to describe the motion of an object.</p> <p>d) Describe the acceleration of an object moving in a circular path at constant speed (i.e., constant speed, but changing direction).</p> <p>e) Analyze the velocity and acceleration of an object over time.</p>
<p>3. Relate the motion of objects to a frame of reference.</p>	<p>a) Compare the motion of an object relative to two frames of reference.</p> <p>b) Predict the motion of an object relative to a different frame of reference (e.g., an object dropped from a moving vehicle observed from the vehicle and by a person standing on the sidewalk).</p> <p>c) Describe how selecting a specific frame of reference can simplify the description of the motion of an object.</p>
<p>4. Use Newton's first law to explain the motion of an object.</p>	<p>a) Describe the motion of a moving object on which balanced forces are acting.</p> <p>b) Describe the motion of a stationary object on which balanced forces are acting.</p> <p>c) Describe the balanced forces acting on a moving object commonly encountered (e.g., forces acting on an automobile moving at constant velocity, forces that maintain a body in an upright position while walking).</p>

STANDARD II: Students will understand the relation between force, mass, and acceleration.

Benchmarks	Skills
<p>1. Analyze forces acting on an object.</p>	<p>a) Observe and describe forces encountered in everyday life (e.g., braking of an automobile - friction, falling rain drops - gravity, directional compass - magnetic, bathroom scale - elastic or spring). b) Use vector diagrams to represent the forces acting on an object. c) Measure the forces on an object using appropriate tools. d) Calculate the net force acting on an object.</p>
<p>2. Using Newton's second law, relate the force, mass, and acceleration of an object.</p>	<p>a) Determine the relationship between the net force on an object and the object's acceleration. b) Relate the effect of an object's mass to its acceleration when an unbalanced force is applied. c) Determine the relationship between force, mass, and acceleration from experimental data and compare the results to Newton's second law. d) Predict the combined effect of multiple forces (e.g., friction, gravity, and normal forces) on an object's motion.</p>
<p>3. Explain that forces act in pairs as described by Newton's third law.</p>	<p>a) Identify pairs of forces (e.g., action-reaction, equal and opposite) acting between two objects (e.g., two electric charges, a book and the table it rests upon, a person and a rope being pulled). b) Determine the magnitude and direction of the acting force when magnitude and direction of the reacting force is known. c) Provide examples of practical applications of Newton's third law (e.g., forces on a retaining wall, rockets, walking). d) Relate the historical development of Newton's laws of motion to our current understanding of the nature of science (e.g., based upon previous knowledge, empirical evidence, replicable observations, development of scientific law).</p>

STANDARD III: Students will understand the factors determining the strength of gravitational and electric forces.

Benchmarks	Skills
<p>1. Relate the strength of the gravitational force to the distance between two objects and the mass of the objects (i.e., Newton’s law of universal gravitation).</p>	<p>a) Investigate how mass affects the gravitational force (e.g., spring scale, balance, or other method of finding a relationship between mass and the gravitational force).</p> <p>b) Distinguish between mass and weight.</p> <p>c) Describe how distance between objects affects the gravitational force (e.g., effect of gravitational forces of the moon and sun on objects on Earth).</p> <p>d) Explain how evidence and inference are used to describe fundamental forces in nature, such as the gravitational force.</p> <p>e) Research the importance of gravitational forces in the space program.</p>
<p>2. Describe the factors that affect the electric force (i.e., Coulomb’s law).</p>	<p>a) Relate the types of charge to their effect on electric force (i.e., like charges repel, unlike charges attract).</p> <p>b) Describe how the amount of charge affects the electric force.</p> <p>c) Investigate the relationship of distance between charged objects and the strength of the electric force.</p> <p>d) Research and report on electric forces in everyday applications found in both nature and technology (e.g., lightning, living organisms, batteries, copy machine, electrostatic precipitators).</p>

STANDARD IV: Students will understand transfer and conservation of energy.

Benchmarks	Skills
<p>1. Determine kinetic and potential energy in a system.</p>	<p>a) Identify various types of potential energy (i.e., gravitational, elastic, chemical, electrostatic, nuclear). b) Calculate the kinetic energy of an object given the velocity and mass of the object. c) Describe the types of energy contributing to the total energy of a given system.</p>
<p>2. Describe conservation of energy in terms of systems.</p>	<p>a) Describe a closed system in terms of its total energy. b) Relate the transformations between kinetic and potential energy in a system (e.g., moving magnet induces electricity in a coil of wire, roller coaster, internal combustion engine). c) Gather data and calculate the gravitational potential energy and the kinetic energy of an object (e.g., pendulum, water flowing downhill, ball dropped from a height) and relate this to the conservation of energy of a system. d) Evaluate social, economic, and environmental issues related to the production and transmission of electrical energy.</p>
<p>3. Describe common energy transformations and the effect on availability of energy.</p>	<p>a) Describe the loss of useful energy in energy transformations. b) Investigate the transfer of heat energy by conduction, convection, and radiation. c) Describe the transformation of mechanical energy into electrical energy and the transmission of electrical energy. d) Research and report on the transformation of energy in electrical generation plants (e.g., chemical to heat to electricity, nuclear to heat to mechanical to electrical, gravitational to kinetic to mechanical to electrical), and include energy losses during each transformation.</p>

STANDARD V: Students will understand the properties and applications of waves.

Benchmarks	Skills
<p>1. Demonstrate an understanding of mechanical waves in terms of general wave properties.</p>	<ul style="list-style-type: none">a) Differentiate between period, frequency, wavelength, and amplitude of waves.b) Investigate and compare reflection, refraction, and diffraction of waves.c) Provide examples of waves commonly observed in nature and/or used in technological applications.d) Identify the relationship between the speed, wavelength, and frequency of a wave.e) Explain the observed change in frequency of a mechanical wave coming from a moving object as it approaches and moves away (i.e., Doppler effect).f) Explain the transfer of energy through a medium by mechanical waves.
<p>2. Describe the nature of electromagnetic radiation and visible light.</p>	<ul style="list-style-type: none">a) Describe the relationship of energy to wavelength or frequency for electromagnetic radiation.b) Distinguish between the different parts of the electromagnetic spectrum (e.g., radio waves and x-rays or visible light and microwaves).c) Explain that the different parts of the electromagnetic spectrum all travel through empty space and at the same speed.d) Explain the observed change in frequency of an electromagnetic wave coming from a moving object as it approaches and moves away (i.e., Doppler effect, red/blue shift).e) Provide examples of the use of electromagnetic radiation in everyday life (e.g., communications, lasers, microwaves, cellular phones, satellite dishes, visible light).