



EAST MAINE
SCHOOL DISTRICT 63

Grade Level Standards

Eighth

Updated July 2017

Grade 8 Standards – Enrichment Courses

English Language Arts

Reading Standards for Literature	
Key Ideas and Details	<ul style="list-style-type: none"> • Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text. • Determine a theme or central idea of a text and analyze its development over the course of the text, including how it is conveyed through particular details; provide an accurate summary of the text distinct from personal opinions or judgments. • Analyze how particular lines of dialogue or incidents in a story or drama propel the action, reveal aspects of a character, or provoke a decision.
Craft and Structure	<ul style="list-style-type: none"> • Determine the meaning of words and phrases as they are used in a text, including analogies or allusions to other texts; analyze the impact of specific word choices on meaning and tone. • Compare and contrast the structure of two or more texts and analyze how the differing structure of each text contributes to its meaning and style. • Explain how differences in the point of view of characters and the audience or reader (e.g., created through the use of dramatic irony) creates such effects as suspense or humor.
Integration of Knowledge and Ideas	<ul style="list-style-type: none"> • Analyze the extent to which a filmed or live production of a story or drama stays faithful to or departs from the text or script, evaluating the choices made by the director or actors. • Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works such as the Bible, including describing how the material is rendered new.
Range of Reading and Level of Text Complexity	<ul style="list-style-type: none"> • By the end of the year, read and comprehend literature, including stories, dramas, and poems, in the grades 6–8 text complexity band independently and proficiently.

Reading Standards for Informational Text	
Key Ideas and Details	<ul style="list-style-type: none"> • Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text. • Determine a central idea of a text and analyze its development over the course of the text, including how it is conveyed through particular details; provide an accurate summary of the text distinct from personal opinions or judgments. • Analyze how a text makes connections among and distinctions between key individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
Craft and Structure	<ul style="list-style-type: none"> • Determine the meaning of words and phrases as they are used in a text, including analogies or allusions to other texts; analyze the impact of specific word choices on meaning and tone. • Analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept. • Determine an author’s point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.
Integration of Knowledge and Ideas	<ul style="list-style-type: none"> • Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea. • Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient and identifying when irrelevant evidence is introduced.

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Reading Standards for Informational Text	
	<ul style="list-style-type: none"> • Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.
Range of Reading and Level of Text Complexity	<ul style="list-style-type: none"> • By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band independently and proficiently.

Speaking and Listening	
Comprehension and Collaboration	<ul style="list-style-type: none"> • Engage effectively in a range of collaborative discussions (one-on-one and in groups) on <i>grade 8 topics, texts, and issues</i>, building on others' ideas and expressing their own clearly. <ul style="list-style-type: none"> ○ Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. ○ Work with peers to set rules for collegial discussions, clear goals and deadlines, and individual roles as needed. ○ Pose questions that connect the ideas of several speakers and elicit elaboration, and respond to others' questions and comments with relevant evidence, observations, and ideas. ○ Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views and understanding in light of the evidence presented. • Determine the purpose of information in graphical, oral, visual, or multimodal formats and evaluate the motives (e.g., social, commercial, political) behind its presentation. • Delineate a speaker's argument and specific claims, evaluating the validity of the reasoning and sufficiency of the evidence.
Presentation of Knowledge and Ideas	<ul style="list-style-type: none"> • Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. • Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. • Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Writing Standards	
Text Types and Purposes	<ul style="list-style-type: none"> • Write arguments to support claims with clear reasons and relevant evidence. <ul style="list-style-type: none"> ○ Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. ○ Support claim(s) with logical reasoning and relevant evidence, using credible sources and demonstrating an understanding of the topic or text. ○ Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ Establish and maintain a formal style. ○ Provide a concluding statement or section that follows from and supports the argument presented.

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Writing Standards	
	<ul style="list-style-type: none"> • Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. <ul style="list-style-type: none"> ○ Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ Establish and maintain a formal style. ○ Provide a concluding statement or section that follows from and supports the information or explanation presented. • Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. <ul style="list-style-type: none"> ○ Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. ○ Use narrative techniques, such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters. ○ Use a variety of transition words, phrases, and clauses to convey sequence, signal shifts from one time frame or setting to another, and show the relationships among experiences and events. ○ Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events. ○ Provide a conclusion that follows from and reflects on the narrated experiences or events.
Production and Distribution of Writing	<ul style="list-style-type: none"> • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. • Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. • Use technology, including the Internet, to produce and publish a minimum of five pages of writing as well as to interact and collaborate with others.
Research to Build and Present Knowledge	<ul style="list-style-type: none"> • Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. • Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. • Draw evidence from literary or informational texts to support analysis, reflection, and research. <ul style="list-style-type: none"> ○ Apply <i>grade 8 Reading standards</i> to literature (e.g., —Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works such as the Bible, including describing how the material is rendered new).

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Writing Standards	
	<ul style="list-style-type: none"> ○ Apply <i>grade 8 Reading standards</i> to literary nonfiction (e.g., —Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient and identifying when irrelevant evidence is introduced).
Range of Writing	<ul style="list-style-type: none"> ● Write routinely over extended time frames (time for research, 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.

Language Standards	
Conventions	<ul style="list-style-type: none"> ● Observe conventions of grammar and usage when writing or speaking. <ul style="list-style-type: none"> ○ Explain the function of verbals (gerunds, participles, infinitives) in general and their function in particular sentences. ○ Form and use verbs in the active and passive voice. ○ Form and use verbs in the indicative, imperative, interrogative, conditional, and subjunctive mood. ○ Recognize and correct inappropriate shifts in verb voice and mood. ● Observe conventions of capitalization, punctuation, and spelling when writing. <ul style="list-style-type: none"> ○ Use punctuation (comma, ellipsis, dash) to indicate a pause or break ○ Use an ellipsis to indicate an omission. ○ Spell correctly
Effective Language Use	<ul style="list-style-type: none"> ● Use language to enhance meaning, convey style, and achieve particular effects when writing or speaking. <ul style="list-style-type: none"> ○ Use verbs in the active and passive voice and in the conditional and subjunctive mood to achieve particular effects (e.g., emphasizing the actor or the action; expressing uncertainty or describing a state contrary to fact).
Vocabulary Acquisition and Usage	<ul style="list-style-type: none"> ● Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on <i>grade 8 reading and content</i>, choosing flexibly from a range of strategies. <ul style="list-style-type: none"> ○ Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. ○ Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., <i>precede</i>, <i>recede</i>, <i>secede</i>). ○ Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. ○ Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary). ● Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. <ul style="list-style-type: none"> ○ Interpret figures of speech (e.g. verbal irony, puns) in context. ○ Use the relationship between particular words to better understand each of the words. ○ Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., <i>bullheaded</i>, <i>willful</i>, <i>firm</i>, <i>persistent</i>, <i>resolute</i>) ● Acquire and use accurately grade-appropriate general academic and domain-specific vocabulary.

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Math

The Number System

Know that there are numbers that are not rational, and approximate them by rational numbers.

- Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
- Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*

Expressions and Equations

Work with radicals and integer exponents.

- Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.*
- Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
- Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9 , and determine that the world population is more than 20 times larger.*
- Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Understand the connections between proportional relationships, lines, and linear equations.

- Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*
- Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .

Analyze and solve linear equations and pairs of simultaneous linear equations.

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- Solve linear equations in one variable.
 - Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).
 - Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
- Analyze and solve pairs of simultaneous linear equations.
 - Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
 - Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.*
 - Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

Functions

Define, evaluate, and compare functions.

- Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8.)
- Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*
- Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points $(1,1)$, $(2,4)$ and $(3,9)$, which are not on a straight line.*

Use functions to model relationships between quantities.

- Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
- Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

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Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software.

- Verify experimentally the properties of rotations, reflections, and translations:
 - Lines are taken to lines, and line segments to line segments of the same length.
 - Angles are taken to angles of the same measure.
 - Parallel lines are taken to parallel lines.
- Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
- Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
- Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
- Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*

Understand and apply the Pythagorean Theorem.

- Explain a proof of the Pythagorean Theorem and its converse.
- Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

- Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Statistics and Probability

Investigate patterns of association in bivariate data.

- Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
- Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
- Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*
- Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*

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Math Practice Standards

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Algebra

Number and Quantity

- Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
- Solve quadratic equations with real coefficients that have complex solutions.
- Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
- Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
- Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Algebra

- Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a , the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.
- Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
- Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n , where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.
- Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
- Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law $V = IR$ to highlight resistance R .
- Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- Solve quadratic equations in one variable
- Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

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- Solve quadratic equations by inspection, taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .
- Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
- Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
- Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
- Interpret expressions that represent a quantity in terms of its context. (Uses Modeling)
- Interpret parts of an expression, such as terms, factors, and coefficients.
- Interpret complicated expressions by viewing one or more of their parts as a single entity.
- Use the structure of an expression to identify ways to rewrite it.
- Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (Uses Modeling)
- Factor a quadratic expression to reveal the zeros of the function it defines.
- Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.

Functions

- Write a function that describes a relationship between two quantities. (Uses Modeling)
- Determine an explicit expression, a recursive process, or steps for calculation from a context.
- Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.
- Compose functions. For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature at the location of the weather balloon as a function of time.
- Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
- Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- Find inverse functions
- Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse.
- Verify by composition that one function is the inverse of another.
- Read values of an inverse function from a graph or a table, given that the function has an inverse.
- Produce an invertible function from a non-invertible function by restricting the domain.
- Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
- Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain,

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Functions

then $f(x)$ denotes the output of f corresponding to the input x . The graph of f is the graph of the equation $y = f(x)$.

- Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.
- For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.
- Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
- Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (Uses Modeling)
- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.
- Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
- Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a , c , and d are numbers and the base b is 2, 10, or e ; evaluate the logarithm using technology.
- Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
- Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
- Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

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Geometry

- Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
- Derive the equation of a parabola given a focus and directrix.
- Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.
- Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0, 2)$.
- Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
- Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

Statistics and Probability

- Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
- Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
- Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
- Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
- Fit a linear function for a scatter plot that suggests a linear association.
- Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.

Math Practice Standards

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Science

Understand-Apply Scientific Knowledge

- Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
- Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

Grade 8 Standards – Enrichment Courses

Understand-Apply Scientific Knowledge

- Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
- Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
- Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
- Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
- Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
- Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
- Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
- Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
- Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
- Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
- Analyze and interpret data to determine scale properties of objects in the solar system.
- Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
- Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Grade 8 Standards – Enrichment Courses

Reading For Literacy in Science

- Cite specific textual evidence to support analysis of science and technical texts.
- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
- Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
- Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
- By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Writing in Science

- Write arguments focused on discipline-specific content.
- Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- Establish and maintain a formal style.
- Provide a concluding statement or section that follows from and supports the argument presented.
- Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to inform about or explain the topic.
- Establish and maintain a formal style and objective tone.
- Provide a concluding statement or section that follows from and supports the information or explanation presented.
- Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.
- Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically.
- Use narrative techniques, such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters
- Use a variety of transition words, phrases, and clauses to convey sequence, signal shifts from one time frame or setting to another, and show the relationships among experiences and events.

Grade 8 Standards – Enrichment Courses

Writing in Science

- Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.
- Provide a conclusion that follows from and reflects on the narrated experiences or events.
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
- Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
- Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- Draw evidence from informational texts to support analysis reflection, and research.

Social Studies

Inquiry Skills

- Constructing Essential Questions
- Constructing Supporting Questions
- Determining Helpful Sources
- Gathering and Evaluating Sources
- Developing Claims and Using Evidence
- Communicating Conclusion
- Critiquing Conclusions
- Taking Informed Action

Disciplinary Concepts

- Civic and Political Institutions-Individuals' roles and responsibilities
- Civic and Political Institutions-Functions and responsibilities of government
- Participation of individuals and groups in society
- Principles, interests, and the deliberative process
- Applying Civic Virtues and Democratic Principles
- Processes, Rules, and Law
- Human Environment Interaction: Place, Regions, and Culture
- Human Population-geography
- Geographic Representations Human Environment Interaction Population
- Global Interconnections
- Economic Decision Making
- Exchange and Markets
- The National and Global Economy
- Financial Literacy-individual
- Financial Literacy-relationships between individuals and institutions
- Change, Continuity, and Context-history
- Perspectives-historical
- Historical Sources and Evidence
- Causation and Argumentation-history

Grade 8 Standards – Enrichment Courses

Kinetic Wellness

Locomotor Skills-Sports

- Demonstrate control when performing combinations and sequences of locomotor, non-locomotor and manipulative motor patterns in selected activities, games and sports
- Compare and contrast efficient and inefficient movement patterns
- Apply rules and safety procedures in physical activities
- Apply basic offensive, defensive and cooperative strategies in selected activities, games and sports
- Participate daily in moderate to vigorous physical activity while performing multiple movement patterns consistently with additional combination movement patterns
- Understand multiple movement patterns and their effects on the brain

Fitness Skills-Tests

- Identify the principles of training: frequency, intensity, time and type (FITT)
- Identify and participate in activities associated with the components of health-related fitness
- Monitor intensity of exercise through a variety of methods (e.g., perceived exertion, pulse monitors, target heart rate), with and without the use of technology
- Evaluate the strengths and weaknesses of a personal fitness profile
- Set realistic short-term and long-term goals for a health-related fitness component
- Identify opportunities within the community for regular participation in physical activities
- Apply the principles of training to the health-related fitness goals
- Discuss and understand the importance of fitness as it relates to academic performance

Cooperative Team Building

- Follow directions and decisions of responsible individuals (e.g., teachers, peer leaders, squad leaders)
- Participate in establishing procedures for group physical activities.
- Remain on task independent of distraction (e.g., peer pressure, environmental stressors)
- Work cooperatively with others to accomplish a set goal in both competitive and non-competitive situations (e.g., baseball, choreographing a dance)

Health

Basic Principles of Health Promotion/Prevention; Treatment of illness/injury

- Identify and describe ways to reduce health risks common to adolescents (e.g., exercise, diet, refusal of harmful substances)
- Identify how positive health practices and relevant health care can help reduce health risks (e.g., proper diet and exercise reduce risks of cancer and heart disease)
- Explain routine safety precautions in practical situations (e.g., in motor vehicles, on bicycles, in and near water, as a pedestrian)
- Identify various careers involved in health promotion, health care and injury prevention
- Describe how the individual influences the health and well-being of the workplace and the community (e.g., volunteerism, disaster preparedness, proper care to prevent the spread of illness)
- Identify potential environmental conditions that may affect the health of the local community (e.g., pollution, land fill, lead-based paint)
- Develop potential solutions to address environmental problems that affect the local community's health
- Identify and communicate with others within your school, family and community regarding health issues

Grade 8 Standards – Enrichment Courses

Understand Human Body Systems

- Explain how body systems interact with each other (e.g., blood transporting nutrients from the digestive system and oxygen from the respiratory system)
- Explain the effects of health-related actions upon body systems (e.g., fad diets, orthodontics, avoiding smoking, alcohol use and other drug use)
- Describe the relationships among physical, mental and social health factors during adolescence (e.g., the effects of stress on physical and mental performance, effects of nutrition on growth)
- Explain how the brain is affected by movement

Decision Making Skills

- Describe possible causes and consequences of conflict and violence among youth in schools and communities
- Demonstrate methods for addressing interpersonal differences without harm (e.g., avoidance, compromise, cooperation)
- Explain how positive communication helps to build and maintain relationships at school, at home and in the workplace
- Apply a decision-making process to an individual health concern
- Apply refusal and negotiation skills to potentially harmful situations

Visual Art

Techniques, Processes, and Tools

- Describe how the choices of tools/technologies and processes are used to create specific effects in the arts.
- Demonstrate knowledge and skills to create 2- and 3-dimensional works and time arts (e.g., film, animation, video) that are realistic, abstract, functional and decorative.
- Understand the concepts of tone, and intensity.
- Apply expressive use of color to show mood and emotion.
- Draw architectural forms in linear perspective
- Apply contour lines, gesture, and sketch.
- Apply texture to 2D and 3D artwork.
- Create linear perspective to show depth
- Create cultural motifs
- Demonstrate understanding and use of balance and its variation.
- Use contrast to create a center of interest
- Use color to show depth; warm-advance, cool-recede
- Use the computer to create a graphic design layout demonstrating visual art concepts
- Ceramics, painting, and drawing
- Explore art styles and periods.

Reflection, Critique, and Culture

- Identify/describe elements of value, perspective and color schemes
- Identify/describe the principles of contrast, emphasis and unity
- Identify/describe expressive qualities of thematic development and sequence
- Analyze how the elements and principles can be organized to convey meaning through a variety of media and technology.
- Compare and contrast the elements and principles in two or more art works that share similar themes.
- Use art elements and principles of design to solve specific artistic problems
- Create and evaluate the effectiveness of artwork in terms of its function

Grade 8 Standards – Enrichment Courses

Reflection, Critique, and Culture

- Compare and contrast how the arts function in ceremony, technology, politics, communication and entertainment.
- Know and describe how artists and their works shape culture and increase understanding of societies, past and present.
- Make choices in using and evaluating a wide range of art materials and medium to solve specific problems
- Reflect on, plan and choose appropriate art processes and techniques to solve specific problems
- Understand and identify historical and cultural contexts of a variety of art objects and how resources of a culture influence their art
- Analyze and describe meanings of specific works of art through aesthetic, historical, and cultural context
- Understand the role of the graphic designer
- Identify and describe careers and jobs in and among the arts and how they contribute to the world of work.

Band and Orchestra – Instrumental Music and Choir

Creating

- Generalize and conceptualize artistic ideas and work
- Organize and develop artistic ideas and work
- Revise, refine, and complete artistic work

Performing

- Select, analyze, and interpret artistic work for presentation
- Develop and refine artistic techniques and work for presentation
- Convey meaning through the presentation of artistic work

Responding

- Perceive and analyze artistic work
- Construct meaningful interpretations of artistic work
- Apply criteria to evaluate artistic work

Connecting

- Synthesize and relate knowledge and personal experiences to make art
- Relate artistic ideas and works with societal, cultural, and historical context to deepen understanding

Spanish Foreign Language and Spanish for Spanish Speakers

Speaking and Listening

- Engage in conversations, provide and obtain information, express feelings and emotions, and exchange opinions
- Understand and interpret written and spoken language on a variety of topics
- Present information, concepts, and ideas to an audience of listeners or readers on a variety of topics
- Respond appropriately to simple commands in the target language
- Respond to and ask simple questions with prompts
- Imitate pronunciation, intonation and inflection including sounds unique to the target language
- Identify main characters, settings and events from selected samples of children’s literature using audio and visual cues

Grade 8 Standards – Enrichment Courses

Reading

- Understand and interpret written and spoken language on a variety of topics
- Recognize the written form of familiar spoken language and predict meaning of key words in a simple story, poem or song
- Infer meaning of cognates from context
- Identify main characters, settings and events from selected samples of children’s literature using audio and visual cues

Writing

- Present information, concepts, and ideas to an audience of listeners or readers on a variety of topics
- Copy/write words, phrases and simple sentences
- Describe people, activities and objects from school and home

Language

- Demonstrate understanding of the nature of language through comparisons of the language studied and their own
- Recognize basic language patterns (e.g., forms of address, questions, case)
- Use common forms of courtesy, greetings and leave-takings appropriate to the time of day and relationship (adult, peer, parent)
- Use the target language vocabulary in the appropriate context and setting

Culture

- Demonstrate understanding of the concept of culture through comparisons of the cultures studied and their own
- Recognize important people and events (e.g., special celebrations) in the history of areas where the target language is spoken
- Identify and use simple geography vocabulary (e.g., border, city, river, soil, equator) of the target language
- Recognize the currency of the country(ies) where the target language is spoken and compare values with United States currency

Drama

Creating

- Imagine and explore solutions to staging and design challenges of a performance space in a drama/theatre work.
- Develop a scripted or improvised character by articulating the character's inner thoughts, objectives, and motivations in a drama/theatre work.
- Articulate and apply critical analysis, background knowledge, research, and historical and cultural context to the development of original ideas for a drama/theatre work.
- Share leadership and responsibilities to develop collaborative goals when preparing or devising drama/theatre work.
- Revise or refine effective character development and technical design in an improvised or scripted drama/theatre work.

Grade 8 Standards – Enrichment Courses

Performing

- Consider various staging choices to enhance the story in a drama/theatre work.
- Use various character objectives and tactics in a drama/theatre work to overcome an obstacle.
- Use a variety of acting techniques to increase skills in a rehearsal or drama/theatre performance.
- Use a variety of technical elements to create a design for a rehearsal or drama/theatre production.
- Perform a rehearsed drama/theatre work for an audience.

Responding

- Apply criteria to the evaluation of artistic choices in a drama/theatre work.
- Recognize and share artistic choices, and apply personal aesthetics, preferences, and beliefs to evaluate a drama/theatre work.
- Analyze how cultural perspectives influence the evaluation of a drama/theatre work.
- Respond to a drama/theatre work, its production elements, and its impact on a specific audience using supporting evidence, personal aesthetics, and artistic criteria.

Connecting

- Incorporate multiple perspectives and diverse community ideas in a drama/theatre work.
- Use different forms of drama/theatre work to examine contemporary social, cultural, or global issues.
- Research and discuss how a playwright might have intended a drama/theatre work to be produced.
- Examine artifacts from a time period and geographic location to better understand performance and design choices in a drama/theatre work.

Speech and Debate

Comprehension and Collaboration

- Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade appropriate topics, texts, and issues, building on others' ideas and expressing their own clearly.
- Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
- Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
- Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
- Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
- Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
- Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Research and Writing

- Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- Draw evidence from literary or informational texts to support analysis, reflection, and research.

Grade 8 Standards – Enrichment Courses

Presentation of Knowledge and Skills

- Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
- Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
- Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

STEAM

Empowered Learner

- Personal Learning Goals
- Learning Environments
- Uses Tech to Demonstrate Learning
- Concepts of Technology Operations

Digital Citizenship

- Manage Digital Identity
- Safe and Ethical Behavior
- Use of Intellectual Property
- Privacy and Security

Knowledge Constructor

- Research Strategies
- Evaluate Information Accuracy
- Curation of Artifacts

Innovative Designer

- Use of Design Process
- Use of Digital Tools
- Use of Cyclical Design Process
- Exhibit a Tolerance for Ambiguity

Computational Thinker

- Formulate Problem Definitions
- Collect and Analyze Data
- Identifying Key Information
- Automated Solutions

Creative Communicator

- Use of Tools and Platforms
- Original or Repurposed Work
- Communicate Complex Ideas
- Create Customized Content

Global Collaborator

- Engaging with Learners

Grade 8 Standards – Enrichment Courses

Global Collaborator

- Use of Collaborative Technologies
- Contribute to Teams
- Explore Local and Global Issues