Grade 7
Math Standards

» Ratios & Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $^{1/2}/_{1/4}$ miles per hour, equivalently 2 miles per hour*.
2. Recognize and represent proportional relationships between quantities.
    a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
    b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
    c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn*.
    d. Explain what a point (*x*, *y*) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r*) where r is the unit rate.
3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

» The Number System

Apply and extend previous understandings of operations with fractions.

1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
    a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged*.
    b. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
    c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
    d. Apply properties of operations as strategies to add and subtract rational numbers.
2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
    a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.
c. Apply properties of operations as strategies to multiply and divide rational numbers.
d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

3. Solve real-world and mathematical problems involving the four operations with rational numbers.

» Expressions & Equations

Use properties of operations to generate equivalent expressions.

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, $a + 0.05a = 1.05a$ means that "increase by 5%" is the same as "multiply by 1.05."*

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation*.
4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
    a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*
    b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions*.

» Geometry

Draw construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

» Statistics & Probability

Use random sampling to draw inferences about a population.

1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be*.

Draw informal comparative inferences about two populations.

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable*.
4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book*.

Investigate chance processes and develop, use, and evaluate probability models.

5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times*.
7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
    a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected*.
    b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or*

that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?

8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
    a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
    b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.
    c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

English Language Arts Standards

» Reading: Literature

Key Ideas and Details:

1. Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
2. Determine a theme or central idea of a text and analyze its development over the course of the text; provide an objective summary of the text.
3. Analyze how particular elements of a story or drama interact (e.g., how setting shapes the characters or plot).

Craft and Structure:

4. Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama.
5. Analyze how a drama's or poem's form or structure (e.g., soliloquy, sonnet) contributes to its meaning
6. Analyze how an author develops and contrasts the points of view of different characters or narrators in a text.

Integration of Knowledge and Ideas:

7. Compare and contrast a written story, drama, or poem to its audio, filmed, staged, or multimedia version, analyzing the effects of techniques unique to each medium (e.g., lighting, sound, color, or camera focus and angles in a film).
8. (RL.7.8 not applicable to literature)
9. Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history.

Range of Reading and Level of Text Complexity:

10. By the end of the year, read and comprehend literature, including stories, dramas, and poems, in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

» Reading: Informational Text

Key Ideas and Details:

1. Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
2. Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

3. Analyze the interactions between individuals, events, and ideas in a text (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).

Craft and Structure:

4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.
5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to the development of the ideas.
6. Determine an author's point of view or purpose in a text and analyze how the author distinguishes his or her position from that of others.

Integration of Knowledge and Ideas:

7. Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).
8. Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.
9. Analyze how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.

Range of Reading and Level of Text Complexity:

10. By the end of the year, read and comprehend literary nonfiction in the grades 6-8 text complexity band proficiently, with scaffolding as needed at the high end of the range.

» Writing

Text Types and Purposes:

1. Write arguments to support claims with clear reasons and relevant evidence.
    a. Introduce claim(s), acknowledge alternate or opposing claims, and organize the reasons and evidence logically.
    b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
    c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence.
    d. Establish and maintain a formal style.
    e. Provide a concluding statement or section that follows from and supports the argument presented.
2. Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
    a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
    b. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
    c. Use appropriate transitions to create cohesion and clarify the relationships among ideas and concepts.
    d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
    e. Establish and maintain a formal style.
    f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.
    a. 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.
    b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters.
    c. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another.
    d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.
    e. Provide a conclusion that follows from and reflects on the narrated experiences or events.

Production and Distribution of Writing:

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)
5. 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. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grade 7.)
6. Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.

Research to Build and Present Knowledge:

7. Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.
8. 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.
9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
    a. Apply *grade 7 Reading standards* to literature (e.g., "Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history").
    b. Apply *grade 7 Reading standards* to literary nonfiction (e.g. "Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims").

Range of Writing:

10. 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.

» Speaking & Listening

Comprehension and Collaboration:

1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

   a. 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.
   b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
   c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
   d. Acknowledge new information expressed by others and, when warranted, modify their own views.
2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.

Presentation of Knowledge and Ideas:

4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
5. Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 7 Language standards 1 and 3 for specific expectations.)

» Language

Conventions of Standard English:

1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
   a. Explain the function of phrases and clauses in general and their function in specific sentences.
   b. Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas.
   c. Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.*
2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
   a. Use a comma to separate coordinate adjectives (e.g., *It was a fascinating, enjoyable movie* but not *He wore an old[,] green shirt*).
   b. Spell correctly.

Knowledge of Language:

3. Use knowledge of language and its conventions when writing, speaking, reading, or listening.
   a. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.

Vocabulary Acquisition and Use:

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 7 reading and content*, choosing flexibly from a range of strategies.
   a. 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.
   b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., *belligerent, bellicose, rebel*).

c. 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.
d. 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).

5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.
    a. Interpret figures of speech (e.g., literary, biblical, and mythological allusions) in context.
    b. Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words.
    c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *refined, respectful, polite, diplomatic, condescending*).
6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Science Standards

» Science Process

Inquiry Process:

1. Inquiry involves generating questions, conducting investigations, and developing solutions to problems through reasoning and observation.

    a. Generate scientific questions based on observations, investigations, and research.
    b. Design and conduct scientific investigations.
    c. Use tools and equipment (spring scales, stop watches, meter sticks and tapes, models, hand lens) appropriate to scientific investigations.
    d. Use metric measurement devices in an investigation.
    e. Construct charts and graphs from data and observations.
    f. Identify patterns in data.

Inquiry Analysis and Communication:

2. Inquiry includes an analysis and presentation of findings that lead to future questions, research, and investigations.

    a. Analyze information from data tables and graphs to answer scientific questions.
    b. Evaluate data, claims, and personal knowledge through collaborative science discourse.
    c. Communicate and defend findings of observations and investigations using evidence.
    d. Draw conclusions from sets of data from multiple trials of a scientific investigation.
    e. Use multiple sources of information to evaluate strengths and weaknesses of claims, arguments, or data.

Reflection and Social Implications:

3. Reflecting on knowledge is the application of scientific knowledge to new and different situations. Reflecting on knowledge requires careful analysis of evidence that guides decision-making and the application of science throughout history and within society.

    a. Evaluate the strengths and weaknesses of claims, arguments, and data.
    b. Describe limitations in personal and scientific knowledge.

c. Identify the need for evidence in making scientific decisions.
d. Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
e. Design solutions to problems using technology.
f. Describe the effect humans and other organisms have on the balance in the natural world.
g. Describe how science and technology have advanced because of the contributions of many people throughout history and across cultures.

» Physical Science

Energy:

1. Waves and Energy-Waves have energy and transfer energy when they interact with matter. Examples of waves include sound waves, seismic waves, waves on water, and light waves.
    a. Identify examples of waves, including sound waves, seismic waves, and waves on water.
    b. Describe how waves are produced by vibrations in matter.
    c. Demonstrate how waves transfer energy when they interact with matter (for example: tuning fork in water, waves hitting a beach, earthquake knocking over buildings).
2. *Energy Transfer- Energy is transferred from a source to a receiver by radiation, conduction, and convection. When energy is transferred from one system to another, the quantity of energy before the transfer is equal to the quantity of energy after the transfer.*
    a. Explain how light energy is transferred to chemical energy through the process of photosynthesis.
3. Solar Energy Effects- Nuclear reactions take place in the sun producing heat and light. Only a tiny fraction of the light energy from the sun reaches Earth, providing energy to heat the Earth.
    a. Identify that nuclear reactions take place in the sun, producing heat and light.
    b. Explain how only a tiny fraction of light energy from the sun is transformed to heat energy on Earth.

Properties of Matter:

4. Chemical Properties- Matter has chemical properties. The understanding of chemical properties helps to explain how new substances are formed.
    a. Classify substances by their chemical properties (flammability, pH, and reactivity).
5. Elements and Compounds- Elements are composed of a single kind of atom that are grouped into families with similar properties on the periodic table. Compounds are composed of two or more different elements. Each element and compound has a unique set of physical and chemical properties such as boiling point, density, color, conductivity, and reactivity.
    a. Identify the smallest component that makes up an element.
    b. Describe how the elements within the Periodic Table are organized by similar properties into families (highly reactive metals, less reactive metals, highly reactive nonmetals, and some almost completely non-reactive gases).
    c. Illustrate the structure of molecules using models or drawings (water, carbon dioxide, table salt).
    d. Describe examples of physical and chemical properties of elements and compounds (boiling point, density, color, conductivity, reactivity).

Changes in Matter:

6. Chemical Changes- Chemical changes occur when two elements and/or compounds react (including decomposing) to produce new substances. These new substances have different physical and chemical properties than the original elements and/or compounds. During the chemical change, the number and kind of atoms in the reactants are the same as the number and kind of atoms in the products. Mass is conserved during chemical changes. The mass of the reactants is the same as the mass of the products. *
    a. Identify evidence of chemical change through color, gas formation, solid formation, and temperature change.
    b. Compare and contrast the chemical properties of a new substance with the original after a chemical change.

c. Describe the physical properties and chemical properties of the products and reactants in a chemical change.

» Life Science

Organization of Living Things:

1. Cell Functions- All organisms are composed of cells, from one cell to many cells. In multicellular organisms, specialized cells perform specialized functions. Organs and organ systems are composed of cells, and function to serve the needs of cells for food, air, and waste removal. The way in which cells function is similar in all living organisms.
    a. Recognize that all organisms are composed of cells (single cell organisms, multicellular organisms).
    b. Explain how cells make up different body tissues, organs, and organ systems.
    c. Describe how cells in all multicellular organisms are specialized to take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or organism needs.
    d. Recognize that cells function in a similar way in all organisms.
2. Growth and Development- Following fertilization, cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissue of multicellular organisms.
    a. Describe growth and development in terms of increase of cell number and/or cell size.
    b. Examine how through cell division, cells can become specialized for specific functions.
3. Photosynthesis- Plants are producers; they use the energy from light to make sugar molecules from the atoms of carbon dioxide and water. Plants use these sugars along with minerals from the soil to form fats, proteins, and carbohydrates. These products can be used immediately, incorporated into the cells of a plant as the plant grows, or stored for later use.
    a. Recognize the need for light to provide energy for the production of carbohydrates, proteins and fats.
    b. Explain that carbon dioxide and water are used to produce carbohydrates, proteins, and fats.
    c. Describe evidence that plants make, use and store food.

Heredity:

4. Reproduction- Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually.
    a. Compare how characteristics of living things are passed on through generations, both asexually and sexually.
    b. Compare and contrast the advantages and disadvantages of sexual vs. asexual reproduction.

» Earth Science

Earth Systems:

1. Solar Energy- The sun is the major source of energy for phenomena on the surface of the Earth.
    a. Demonstrate, using a model or drawing, the relationship between the warming by the sun of the Earth and the water cycle as it applies to the atmosphere (evaporation, water vapor, warm air rising, cooling, condensation, clouds).
    b. Describe the relationship between the warming of the atmosphere of the Earth by the sun and convection within the atmosphere and oceans.
    c. Describe how the warming of the Earth by the sun produces winds and ocean currents.
2. Human Consequences- Human activities have changed the land, oceans, and atmosphere of the Earth resulting in the reduction of the number and variety of wild plants and animals, sometimes causing extinction of species.
    a. Explain how human activities (surface mining, deforestation, overpopulation, construction and urban development, farming, dams, landfills, and restoring natural areas) change the surface of the Earth and affect the survival of organisms.
    b. Describe the origins of pollution in the atmosphere, geosphere, and hydrosphere, (car exhaust, industrial emissions, acid rain, and natural sources), and how pollution impacts habitats, climatic change, threatens or endangers species.

3. Weather and Climate- Global patterns of atmospheric and oceanic movement influence weather and climate.
    a. Compare and contrast the difference and relationship between climate and weather.
    b. Describe how different weather occurs due to the constant motion of the atmosphere from the energy of the sun reaching the surface of the Earth.
    c. Explain how the temperature of the oceans affects the different climates on Earth because water in the oceans holds a large amount of heat.
    d. Describe weather conditions associated with frontal boundaries (cold, warm, stationary, and occluded) and the movement of major air masses and the jet stream across North America using a weather map.
4. Water Cycle- Water circulates through the four spheres of the Earth in what is known as the "water cycle."
    a. Explain the water cycle and describe how evaporation, transpiration, condensation, cloud formation, precipitation, infiltration, surface runoff, ground water, and absorption occur within the cycle.
    b. Analyze the flow of water between the components of a watershed, including surface features (lakes, streams, rivers, wetlands) and groundwater.

Fluid Earth:

5. Atmosphere- The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different physical and chemical composition at different elevations.
    a. Describe the atmosphere as a mixture of gases.
    b. Compare and contrast the composition of the atmosphere at different elevations.

Social Studies Standards

» The World in Temporal Terms: Historical Habits of Mind (Ways of Thinking):

Temporal Thinking:

1. *Use historical conceptual devices to organize and study the past.*
    a. Explain why and how historians use eras and periods as constructs to organize and explain human activities over time.
    b. Compare and contrast several different calendar systems used in the past and present and their cultural significance (e.g., Olmec and Mayan calendar systems, Aztec Calendar Stone, Sun Dial, Gregorian calendar – B.C./A.D.; contemporary secular – B.C.E./C.E. Note: in 7th grade Eastern Hemisphere the Chinese, Hebrew, and Islamic/Hijri calendars are included).

Historical Inquiry and Analysis:

2. *Use historical inquiry and analysis to study the past.*
    a. Explain how historians use a variety of sources to explore the past (e.g., artifacts, primary and secondary sources including narratives, technology, historical maps, visual/mathematical quantitative data, radiocarbon dating, DNA analysis).
    b. Read and comprehend a historical passage to identify basic factual knowledge and the literal meaning by indicating who was involved, what happened, where it happened, what events led to the development, and what consequences or outcomes followed.
    c. Identify the point of view (perspective of the author) and context when reading and discussing primary and secondary sources.
    d. Compare and evaluate competing historical perspectives about the past based on proof.
    e. Identify the role of the individual in history and the significance of one person's ideas.

Historical Understanding:

3. *Use historical concepts, patterns, and themes to study the past.*
    a. Describe and use cultural institutions to study an era and a region (political, economic, religion/belief, science/technology, written language, education, family).
    b. Describe and use themes of history to study patterns of change and continuity.
    c. Use historical perspective to analyze global issues faced by humans long ago and today.

» WHG Era 1 – The Beginnings of Human Society: Beginnings to 4000 B.C.E./B.C.

Peopling of the Earth:

W1.1 Peopling of the Earth

1. *Describe the spread of people in the Eastern Hemisphere in Era 1.*
    a. Explain how and when human communities populated major regions of the Eastern Hemisphere (Africa, Australia, Europe, Asia) and adapted to a variety of environments.
    b. Explain what archaeologists have learned about Paleolithic and Neolithic patterns of living in

Agriculture Revolution:

2. *Describe the Agricultural Revolution and explain why it is a turning point in history.*
    a. Explain the importance of the natural environment in the development of agricultural settlements in different locations (e.g., available water for irrigation, adequate precipitation, and suitable growth season). Explain the impact of the Agricultural Revolution (stable food supply, surplus, population growth, trade, division of labor, development of settlements).
    b. Compare and contrast the environmental, economic, and social institutions of two early civilizations from different world regions (e.g., Yangtse, Indus River Valley, Tigris/Euphrates, and Nile).

» WHG Era 2 –Early Civilizations and Cultures and the Emergence of Pastoral Peoples, 4000 to 1000 B.C.E./B.C.

Early Civilizations and Early Pastoral Societies:

1. Analyze early Eastern Hemisphere civilizations and pastoral societies.
    a. Describe the importance of the development of human language, oral and written, and its relationship to the development of culture
        • verbal vocalizations
        • standardization of physical (rock, bird) and abstract (love, fear) words
        • pictographs to abstract writing (governmental administration, laws, codes, history and artistic expressions)
    b. Use historical and modern maps and other sources to locate, describe, and analyze major river systems and discuss the ways these physical settings supported permanent settlements, and development of early civilizations (Tigris and Euphrates Rivers, Yangtze River, Nile River, Indus River).
    c. Examine early civilizations to describe their common features (ways of governing, stable food supply, economic and social structures, use of resources and technology, division of labor and forms of communication).
    d. Define the concept of cultural diffusion and how it resulted in the spread of ideas and technology from one region to another (e.g., plants, crops, plow, wheel, bronze metallurgy).
    e. Describe pastoralism and explain how the climate and geography of Central Asia were linked to the rise of pastoral societies on the steppes.

» WHG Era 3 –Classical Traditions and Major Empires, 1000 B.C.E./B.C. to 300 C.E./A.D.

Classical Traditions and Major Empires in the Eastern Hemisphere:

1. *Analyze classical civilizations and empires and their lasting impact on institutions, political thought, structures, technology and art forms that grew in India, China, the Mediterranean basin, Africa, and Southwest and Central Asia during this era.*
    a. Describe the characteristics that classical civilizations share (institutions, cultural styles, systems of thought that influenced neighboring peoples and have endured for several centuries).
    b. Using historic and modern maps, locate three major empires of this era, describe their geographic characteristics including physical features and climates, and propose a generalization about the relationship between geographic characteristics and the development of early empires.
    c. Compare and contrast the defining characteristics of a city-state, civilization, and empire.
    d. Assess the importance of Greek ideas about democracy and citizenship in the development of Western political thought and institutions.

e. Describe major achievements from Indian, Chinese, Mediterranean, African, and Southwest and Central Asian civilizations in the areas of art, architecture and culture; science, technology and mathematics; political life and ideas; philosophy and ethical beliefs; and military strategy.
f. Use historic and modern maps to locate and describe trade networks among empires in the classical era.
g. Use a case study to describe how trade integrated cultures and influenced the economy within empires (e.g., Assyrian and Persian trade networks or networks of Egypt and Nubia/Kush; or Phoenician and Greek networks).
h. Describe the role of state authority, military power, taxation systems, and institutions of coerced labor, including slavery, in building and maintaining empires (e.g., Han Empire, Mauryan Empire, Egypt, Greek city-states and the Roman Empire).
i. Describe the significance of legal codes, belief systems, written languages and communications in the development of large regional empires.
j. Create a time line that illustrates the rise and fall of classical empires during the classical period.

Growth and Development of World Religions:

2. *Explain how world religions or belief systems of Hinduism, Judaism, Buddhism, Christianity, Confucianism and Islam grew and their significance. (Islam is included here even though it came after 300 C.E./A.D.)*
    a. Identify and describe the beliefs of the five major world religions.
    b. Locate the geographical center of major religions and map the spread through the 3rd century C.E./A.D.
    c. Identify and describe the ways that religions unified people's perceptions of the world and contributed to cultural integration of large regions of Afro-Eurasia.*(National Geography Standard 6, p. 73)*

» The World in Spatial Terms: Geographical Habits of Mind

Spatial Thinking:

1. *Use maps and other geographic tools to acquire and process information from a spatial perspective.*
    a. Explain and use a variety of maps, globes, and web based geography technology to study the world, including global, interregional, regional, and local scales.
    b. Draw an accurate sketch map from memory of the Eastern Hemisphere showing the major

Geographical Inquiry and Analysis:

2. *Use geographic inquiry and analysis to answer important questions about relationships between people, cultures, their environment, and relations within the larger world context.*
    a. Locate the major landforms, rivers and climate regions of the Eastern Hemisphere.
    b. Explain why maps of the same place may vary as a result of the cultural or historical background of the cartographer.
    c. Use observations from air photos, photographs (print and CD), films (VCR and DVD) as the basis for answering geographic questions about the human and physical characteristics of places and regions.
    d. Draw the general population distribution of the Eastern Hemisphere on a map, analyze the patterns, and propose two generalizations about the location and density of the population.
    e. Use information from modern technology such as Geographic Positioning System (GPS), Geographic Information System (GIS), and satellite remote sensing to locate information and process maps and data to analyze spatial patterns of the Eastern Hemisphere to answer geographic questions.
    f. Apply the skills of geographic inquiry (asking geographic questions, acquiring geographic information, organizing geographic information, analyzing geographic information, and answering geographic questions) to analyze a problem or issue of importance to a region of the Eastern Hemisphere.

Geographical Understanding:

3. *Use geographic themes, knowledge about processes and concepts to study the Earth.*
    a. Use the fundamental themes of geography (location, place, human environment interaction, movement, region) to describe regions or places on earth.
    b. Explain the locations and distributions of physical and human characteristics of Earth by using knowledge of spatial patterns.
    c. Explain the different ways in which places are connected and how those connections demonstrate interdependence and accessibility.

»Places and Regions

Physical Characteristics of Place:

1. *Describe the physical characteristics of places.*
    a. Describe the landform features and the climate of the region (within the Western or Eastern Hemispheres) under study.
    b. Use information from GIS, remote sensing and the World Wide Web to compare and contrast the surface features and vegetation of the continents of the Eastern Hemisphere.

Human Characteristics of Place:

2. *Describe the human characteristics of places.*
    a. Describe the human characteristics of the region under study (including languages, religion, economic system, governmental system, cultural traditions).
    b. Explain that communities are affected positively or negatively by changes in technology (e.g., increased manufacturing resulting in rural to urban migration in China, increased farming of fish, hydroelectric power generation at Three Gorges, pollution resulting from increased manufacturing and automobiles).
    c. Analyze how culture and experience influence people's perception of places and regions (e.g., that beaches are places where tourists travel, cities have historic buildings, northern places are cold, equatorial places are very warm).

»Physical Systems

Physical Process:

1. *Describe the physical processes that shape the patterns of the Earth's surface.*
    a. Construct and analyze climate graphs for two locations at different latitudes and elevations in the region to answer geographic questions and make predictions based on patterns. (e.g., compare and contrast Norway and France; Nairobi and Kilimanjaro; Mumbai and New Delhi).

Ecosystems:

2. *Describe the characteristics and spatial distribution of ecosystems on the Earth's surface.*
    a. Explain how and why ecosystems differ as a consequence of differences in latitude, elevation, and human activities (e.g., effects of latitude on types of vegetation in Africa, proximity to bodies of water in Europe, and effects of annual river flooding in Southeast Asia and China).
    b. Identify ecosystems of a continent and explain why some provide greater opportunities (fertile soil, precipitation) for humans to use than do other ecosystems and how that changes with technology (e.g., China's humid east and arid west and the effects of irrigation technology).

»Human Systems

Cultural Mosaic:

1. *Describe the characteristics, distribution and complexity of Earth's cultural mosaic.*
    a. Identify and explain examples of cultural diffusion within the Eastern Hemisphere (e.g., the spread of sports, music, architecture, television, Internet, Bantu languages in Africa, Islam in Western Europe).
    b. Compare roles of women in traditional African societies in the past with roles of women as modern micro-entrepreneurs in current economics.

Technology Patterns and Networks:

2. *Describe how technology creates patterns and networks that connect people, products, and ideas.*
    a. List and describe the advantages and disadvantages of different technologies used to move people, products, and ideas throughout the world (e.g., opportunities for employment, entrepreneurial and educational opportunities using the Internet; the effects of technology on reducing the time necessary for communications and travel; the uses and effects of wireless technology in developing countries; and the spread of group and individual's ideas as voice and image messages on electronic networks such as the Internet).

Patterns of Human Settlement:

3. *Describe patterns, processes, and functions of human settlement.*
    a. Identify places in the Eastern Hemisphere that have been modified to be suitable for settlement by describing the modifications that were necessary (e.g., Nile River irrigation, reclamation of land along the North Sea, planting trees in areas that have become desertified in Africa).
    b. Describe patterns of settlement by using historical and modern maps (e.g., the location of the world's mega cities, other cities located near coasts and navigable rivers, regions under environmental stress such as the Sahel).

Forces of Cooperation and Conflict:

4. Explain how forces of conflict and cooperation among people influence the division of the Earth's surface and its Resources

    a. Identify and explain factors that contribute to conflict and cooperation between and among cultural groups (e.g., natural resources, power, culture, wealth).
    b. Describe examples of cooperation and conflict within the European Union (e.g., European Parliament, Euro as currency in some countries but not others, open migration within the European Union, free trade, and cultural impacts such as a multi-lingual population).

»Environment and Society

Humans and the Environment:

1. *Describe how human actions modify the environment.*
    a. Describe the environmental effects of human action on the atmosphere (air), biosphere (people, animals, and plants), lithosphere (soil), and hydrosphere (water) (e.g., desertification in the Sahel Region of North Africa, deforestation in the Congo Basin, air pollution in urban center, and chemical spills in European Rivers).
    b. Describe how variations in technology affect human modifications of the landscape (e.g., clearing of agricultural land in Southeast Asia, fish factories in North Atlantic and Western Pacific Ocean, and damming rivers to meet needs for electricity).
    c. Identify the ways in which human-induced changes in the physical environment in one place can cause changes in other places (e.g., cutting forests in one region may result in river basin flooding elsewhere as has happened historically in China; building dams floods land upstream and permits irrigation downstream as in Southern Africa, the Aswan Dam flooded the upper Nile Valley and permitted irrigation downstream).

Physical and Human Systems:

2. *Describe how physical and human systems shape patterns on the Earth's surface.*
    a. Describe the effects that a change in the physical environment could have on human activities and the choices people would have to make in adjusting to the change e.g., drought in Africa, pollution from volcanic eruptions in Indonesia, earthquakes in Turkey, and flooding in Bangladesh).

»Global Issues Past and Present

Public Discourse, Decision Making, and Citizen Involvement:

1. Capstone projects require the student to use geography, history, economics, and government to inquire about major contemporary and historical issues and events linked to the world outside the classroom. The core disciplines are used to interpret the past and plan for the future. During the school year the students will complete at least three capstone projects. *(National Geography Standards 17 and 18, p. 179 and 181)*
    a. Contemporary Investigations – Conduct research on contemporary global topics and issues, compose persuasive essays, and develop a plan for action.
    b. Investigations Designed for Ancient World History Eras – Conduct research on global topics and issues, compose persuasive essays, and develop a plan for action.

»Purposes of Government

Nature of Civic Life, Politics, and Government:

1. *Describe Civic Life, Politics, and Government and explain their relationships.*
    a. Explain how the purposes served by government affect relationships between the individual, government, and society as a whole and the differences that occur in monarchies, theocracies, dictatorships, and representative governments.

»Structure and Functions of Government

Characteristics of Nation-States:

1. *Describe the characteristics of nation-states and how they may interact.*
    a. Define the characteristics of a nation-state (a specific territory, clearly defined boundaries, citizens, and jurisdiction over people who reside there, laws, and government), and how Eastern Hemisphere nations interact.

»Relationships of United State and Other Nations and World Affairs

Conflict and Cooperation Between and Among Nations:

1. *Explain the various ways that nations interact both positively and negatively.*
    a. Explain how governments address national issues and form policies, and how the policies may not be consistent with those of other countries (e.g., population pressures in China compared to Sweden; international immigration quotas, international aid, energy needs for natural gas and oil and military aid).
    b. Explain the challenges to governments and the cooperation needed to address international issues (e.g., migration and human rights).
    c. Explain why governments belong to different types of international and regional organizations (e.g., United Nations (UN), North Atlantic Treaty Organization (NATO), Organization of the Petroleum Exporting Countries (OPEC), European Union (EU), and African Union (AU), G-8 countries (leading economic/political)).

»The Market Economy

Individual, Business, and Government Choices:

1. *Describe how individuals, businesses and government make economic decisions when confronting scarcity in the market economy .*
    a. Explain the role of incentives in different economic systems (acquiring money, profit, goods, wanting to avoid loss, position in society, job placement).
    a. Describe the circular flow model (that businesses get money from households in exchange for goods and services and return that money to households by paying for the factors of production that households have to sell) and apply it to a public service (e.g., education, health care, military protection).

»The National Economy

Role of Government:

1. *Describe how national governments make decisions that affect the national economy*
    a. Explain how national governments make decisions that impact both that country and other countries that use its resources (e.g., sanctions and tariffs enacted by a national government to prevent imports, most favored trade agreements, the impact China is having on the global economy and the U.S. economy in particular).

»International Economy

Economic Interdependence:

1. *Describe patterns and networks of economic interdependence, including trade.*

a. Explain the importance of trade (imports and exports) on national economies in the Eastern Hemisphere (e.g., natural gas in North Africa, petroleum Africa, mineral resources in Asia).
b. Diagram or map the movement of a consumer product from where it is manufactured to where it is sold to demonstrate the flow of materials, labor, and capital (e.g., global supply chain for computers, athletic shoes, and clothing).
c. Determine the impact of trade on a region of the Eastern Hemisphere by graphing and analyzing gross Domestic Product of the region for the past decade and comparing the data with trend data on the total value of imports and exports over the same period.
d. Explain how communications innovations have affected economic interactions and where and how people work (e.g., internet home offices, international work teams, international companies).

Economic Systems:

2. *Describe how societies organize to allocate resources to produce and distribute goods and services.*
    a. Explain and compare how economic systems (traditional, command, and market) answer four basic questions: What should be produced? How will it be produced? How will it be distributed? Who will receive the benefits of production? (e.g., market economies in Africa, Europe; command economy in North Korea; and the transition to market economies in Vietnam and China).

»Public Disclosure, Decision Making, and Citizen Involvement

Identifying and Analyzing Issues, Decision Making, Persuasive Communication About a Public Issue, and Citizen Involvement:

1. Clearly state an issue as a question or public policy, trace the origins of an issue, analyze various perspectives, and generate and evaluate alternative resolutions. Deeply examine policy issues in group discussions and debates to make reasoned and informed decisions. Write persuasive/argumentative essays expressing and justifying decisions on public policy issues. Plan and conduct activities intended to advance views on matters of public policy, report the results, and evaluate effectiveness.
    a. Identify public policy issues related to global topics and issues studied.
    b. Clearly state the issue as a question of public policy orally or in written form.
    c. Use inquiry methods to acquire content knowledge and appropriate data about the issue.
    d. Identify the causes and consequences and analyze the impact, both positive and negative.
    e. Share and discuss findings of research and issue analysis in group discussions and debates.
    f. Compose a persuasive essay justifying the position with a reasoned argument.
    g. Develop an action plan to address or inform others about the issue at the local to global scales.

Citizen Involvement:

2. *Act constructively to further the public good.*
    a. Demonstrate knowledge of how, when, and where individuals would plan and conduct activities intended to advance views in matters of public policy, report the results, and evaluate effectiveness.
    b. Engage in activities intended to contribute to solving a national or international problem studied.
    c. Participate in projects to help or inform others (e.g., service learning projects).