



DAY 1 SUPPLEMENT

The What and Why of Text-Dependent Analysis

Leveraging Text-Dependent
Analysis for Learning

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SECTION A

Connections Between NDE Content Area Standards and Text-Dependent Analysis



8th Grade English Language Arts Standards

Vocabulary

LA 8.1.5

Students will build and use conversational, academic, and content-specific grade-level vocabulary.

LA 8.1.5.d

Analyze and use semantic relationships (e.g., multiple meanings, synonyms, antonyms, figurative language, connotations, subtle distinctions) to determine the meaning of words, aid in comprehension, and improve writing.

Comprehension

LA 8.1.6

Students will construct meaning by applying prior knowledge, using text information, and monitoring comprehension while reading increasingly complex grade-level literary and informational text.

LA 8.1.6.a

Analyze the meaning, reliability, and validity of text considering author's purpose and perspective.

LA 8.1.6.b

Analyze and explain the relationships between elements of literary text (e.g., character development, setting, plot, conflict, point of view, inferred, and recurring themes).

LA 8.1.6.c

Analyze the author's use of literary devices (e.g., simile, metaphor, personification, idiom, oxymoron, hyperbole, alliteration, onomatopoeia, analogy, tone, mood).

LA 8.1.6.d

Summarize, analyze, and synthesize the development of a common theme between two literary texts and/or media.

LA 8.1.6.e

Summarize, analyze, and synthesize the connection between the main ideas of two informational texts and/or media.

LA 8.1.6.f

Analyze and evaluate information from print and digital text features to support comprehension.

LA 8.1.6.g

Cite specific textual evidence to analyze and make inferences based on the characteristics of a variety of literary and informational texts.

LA 8.1.6.h

Analyze the social, historical, cultural, and biographical influences in a variety of texts, citing textual evidence from literary and informational text to develop a national and international multicultural perspective.

LA 8.1.6.i

Construct and/or answer literal, inferential, critical, and interpretive questions and support answers with explicit evidence from the text or additional sources.

8th Grade English Language Arts Standards, continued

Comprehension, continued

LA 8.1.6.j

Apply knowledge of organizational patterns to comprehend informational text (e.g., sequence/chronological, description, spatial, cause and effect, compare/contrast, fact/opinion, proposition/support).

LA 8.1.6.k

Select text for a particular purpose (e.g., answer a question, solve problems, enjoy, form an opinion, understand a specific viewpoint, predict outcomes, discover models for own writing, accomplish a task), citing evidence to support analysis, reflection, or research.

LA 8.1.6.l

Build background knowledge and activate prior knowledge to clarify text, deepen understanding, and make connections while reading complex text.

LA 8.1.6.m

Self-monitor comprehension and independently apply appropriate strategies to understand text.

LA 8.1.6.n

Make and confirm/modify inferences with text evidence while previewing and reading literary, informational, digital text, and/or media.

Writing Process

LA 8.2.1

Students will apply the writing process to plan, draft, revise, edit, and publish writing using correct spelling, grammar, punctuation, and other conventions of standard English appropriate for grade level.

LA 8.2.1.c

Gather and use relevant information and evidence from multiple authoritative print and/or digital sources including primary and secondary sources to support claims or theses.

Writing Modes

LA 8.2.2

Students will write in multiple modes for a variety of purposes and audiences across disciplines.

LA 8.2.2.a

Communicate information and ideas effectively in analytic, argumentative, descriptive, informative, narrative, poetic, persuasive, and reflective modes to multiple audiences using a variety of media and formats.

LA 8.2.2.b

Provide evidence from literary or informational text to support analysis, reflection, and research.

LA 8.2.2.e

Analyze various mentor texts and/or exemplars in order to create a similar piece.

8th Grade English Language Arts Standards, continued

Speaking

LA 8.3.1

Students will develop, apply, and refine speaking skills and strategies to communicate key ideas in a variety of situations.

LA 8.3.1.b

Demonstrate and adjust speaking techniques (e.g., appropriate eye contact, pacing, nonverbal cues, word choice) for a variety of purposes and situations, including interpreting text.

Listening

LA 8.3.2

Students will develop and demonstrate active listening skills across a variety of situations.

LA 8.3.2.b

Analyze the purpose of information presented in diverse media and formats, evaluate its motives (e.g., social, commercial, political), and determine its credibility.

Information Fluency

LA 8.4.1

Students will evaluate, create, and communicate information in a variety of media and formats (textual, visual, and digital).

LA 8.4.1.a

Locate, organize, analyze, evaluate, and synthesize information from print and digital resources to generate and answer questions and create new understandings.

Nebraska Department of Education. 2014. *Nebraska College- and Career-Ready English Language Arts Standards*. <https://cdn.education.ne.gov/wp-content/uploads/2018/06/2014-ELA-Standards.pdf>.

8th Grade Mathematics Standards

Communicates mathematical ideas effectively

Process #3

Students will communicate mathematical ideas effectively and precisely. Students will critique the reasoning of others as well as provide mathematical justifications. Students will utilize appropriate communication approaches individually and collectively and through multiple methods, including writing, speaking, and listening.

Nebraska Department of Education. 2015. *Nebraska's College and Career Ready Standards for Mathematics*. https://www.education.ne.gov/wp-content/uploads/2017/07/2015_Nebraska_College_and_Career_Standards_for_Mathematics_Vertical.pdf.

8th Grade Science Standards

Forces and Interactions

SC.8.1.1.E

Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

Heredity: Inheritance and Variation of Traits

SC.8.9.4.B

Gather and synthesize information about technologies that have changed the way humans influence inheritance of desired traits in organisms.

Natural Selection and Adaptations

SC.8.10.5.A

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.

SC.8.10.5.C

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.

Space Systems

SC.8.11.6.C

Analyze and interpret data to determine scale properties of objects in the solar system.

Nebraska Department of Education. 2017. *Nebraska's College and Career Ready Standards for Science*. https://cdn.education.ne.gov/wp-content/uploads/2017/10/Nebraska_Science_Standards_Final_10_23.pdf.

8th Grade Social Studies Standards

Civics: Civic Participation

SS 8.1.2.d

Evaluate how cooperation and conflict among people have contributed to political, economic, and social events and situations in the United States

Economics: Financial Literacy

SS 8.2.5.a

Compare and contrast characteristics of different economic systems (e.g., traditional, command, market, mixed)

Geography: Places and Regions

SS 8.3.2.a

Analyze physical and human characteristics of places and regions (e.g., climate, language)

SS 8.3.2.b

Analyze impact of land and water features on human decisions (e.g., location of settlements and transportation systems with respect to the location of river valleys, mountains, deserts, plains, oceans)

SS 8.3.2.c

Analyze changes in places and regions over time (e.g., irrigation, growth of cities, Manifest Destiny)

SS 8.3.2.d

Analyze how humans group and label environments and how those groupings/labels impact human societies (e.g., Dixie, Midwest, Ring of Fire)

Geography: Physical Systems

SS 8.3.3.a

Compare and contrast various biomes/climates (e.g., rainforest, grasslands, forests)

SS 8.3.3.b

Analyze the impact of natural events on biomes, climates and wind and water systems (e.g., rivers/floods/precipitation/drought)

Geography: Human Systems

SS 8.3.4.a

Compare and contrast characteristics of groups of people/settlements (e.g., population density, distribution and growth, migration patterns, diffusion of people, places, and ideas, westward expansion of immigrants, Homestead Act)

SS 8.3.4.b

Analyze purpose of population centers (e.g., function of cities as providers of goods and services, economic activities and interdependence, trade and transportation)

SS 8.3.4.c

Analyze and explain components and diffusion of cultures (e.g., religion-spread of various belief systems, popular culture, spread of fast food chains, language-spread of English, technology-adoption of agricultural advancements, railroads, people as carriers and physical and cultural barriers, expansion and relocation, hierarchical-expansion diffusion of fashion from Paris and London to Nebraska communities)

8th Grade Social Studies Standards, continued

Geography: Human/Environment Interaction

SS 8.3.5.c

Analyze issues related to the physical environment globally (e.g., water supply, air quality in cities, solid waste disposal, availability of arable land)

Geography: Application of Geography to Issues and Events

SS 8.3.6.a

Analyze the physical or human geographic factors explaining the spatial pattern of world events (e.g., water scarcity and conflict in the Middle East, contrasting demographic trends in developed and developing countries)

US History: Chronological Thinking

SS 8.4.1

Students will analyze how major past and current US events are chronologically connected, and evaluate their impact(s) upon one another

US History: Historical Comprehension

SS 8.4.2.a

Analyze the impact of people, events, ideas, and symbols, including various cultures and ethnic groups, on history in the United States by era

SS 8.4.2.c

Analyze the appropriate uses of primary and secondary sources

US History: Multiple Perspectives

SS 8.4.3.a

Analyze and interpret how multiple perspectives facilitate the understanding of the full story of US history (e.g., Dawes Act, Chinese Exclusion Act, Treaty of Guadalupe Hidalgo, The Emancipation Proclamation, Organized Labor, Women's Suffrage)

SS 8.4.3.b

Compare and contrast primary and secondary sources to better understand multiple perspectives of the same event (e.g., The Bill of Rights, slavery, Gettysburg Address, The New Colossus Poem, images, political cartoons, photographs, newspapers)

US History: Historical Analysis and Interpretation

SS 8.4.4.a

Analyze sources on Nineteenth-Century American History through determination of credibility, contextualization, and corroboration

SS 8.4.4.b

Evaluate alternative courses of action in United States history (e.g., *Why and how was land acquired?*)

SS 8.4.4.c

Analyze how decisions affected events in the United States (e.g., Supreme Court decisions, immigration, declaration of war)

SS 8.4.4.e

Analyze the relationships among historical events in the United States and the students' lives today (i.e., current events)

8th Grade Social Studies Standards, continued

US History: Historical Research Skills

SS 8.4.5.b

Obtain, analyze and cite appropriate sources for research about Nineteenth-Century US History, incorporating primary and secondary sources (e.g., cite sources using a prescribed format)

SS 8.4.5.d

Present an analysis of historical information about the United States (e.g., pictures, posters, oral/written narratives, and electronic presentations)

World History: Historical Comprehension

SS 8.4.2.a

Analyze the impact of people, events, ideas, and symbols, including various cultures and ethnic groups, on history throughout the world by era

SS 8.4.2.b

Analyze how global civilizations have changed over the course of time, using maps, documents, and other artifacts

SS 8.4.2.c

Analyze the appropriate uses of primary and secondary sources

World History: Multiple Perspectives

SS 8.4.3.a

Analyze and interpret how multiple perspectives facilitate the understanding of the full story of world history (e.g., Chinese Foot Binding, Three Gorges Dam, Caste System, Alexander the Great, Latin American Revolutions, Division of Pakistan, Blood Diamonds)

SS 8.4.3.b

Compare and contrast primary and secondary sources to better understand multiple perspectives of the same event (e.g., Confucius Analects, Code of Hammurabi, slavery, Mandate of Heaven, Conference of Berlin, images and videos - Terracotta Soldiers, Untouchables, foot binding)

World History: Historical Analysis and Interpretation

SS 8.4.4.a

Analyze sources on Early World History through determination of credibility, contextualization, and corroboration

SS 8.4.4.c

Analyze how decisions affected events across the globe (e.g., migrations, declarations of war, treaties, alliances)

SS 8.4.4.e

Analyze the relationships among historical events across the globe and the students' lives today (i.e., current events)

Nebraska Department of Education. 2012. *Nebraska Social Science Standards*.
https://www.education.ne.gov/wp-content/uploads/2017/07/2012December7VerticalNE_SocialStudiesStandardsApproved.pdf.

SECTION B

Practice with Prompts



An Ingenious Solution

An unwelcome visitor

The African elephant easily earns the title of the largest land animal; a full-grown adult male can weigh 14,000 pounds. Its vast size makes the elephant a formidable opponent for African farmers. A small herd can trample farmers' crops, destroy their water pipes, and raid a year's supply from their grain stores in one night.

In the country of Kenya, farmers have attempted to deter elephants by surrounding their fields with thorn bushes or trenches, but those measures have not been effective. At times, the farmers have attempted to frighten off the unwelcome visitors with stones and firecrackers, which leads to dangerous situations if the elephants become aggressive. Unfortunately, the farmers also sometimes retaliate by killing the elephants, whose numbers are declining.

Why are elephants invading farmers' fields? While elephant herds may reside on nature reserves, they often venture from the parks in search of food. Elephants require a vast area to roam to find sufficient food, and it would not be possible to set aside enough protected land to support them. In addition, human populations continue to grow, and people are moving into areas that were once wilderness. When elephants suddenly discover fields of maize and beans near the forest edges, they take advantage of the feast.

A possible solution

Because humans and elephants cannot avoid contact, it is critical to find a peaceful way to coexist with them. One solution may come from bees. Researchers have observed elephants breaking apart beehives. To defend themselves, the insects attack the sensitive areas around an elephant's eyes and mouth. The bees even enter an elephant's trunk and sting it. Usually, an elephant remembers the painful lesson. Most

elephants avoid trees with beehives. Further studies have shown that nervous elephants emitted a low rumbling "bee alarm call" to warn other elephants to escape.

A living, breathing, buzzing fence

Farmers in Kenya began building the first beehive fences. They constructed them by using wires to link together beehives, which hung between posts. They placed the hives about 33 feet apart. They also alternated the active beehives with "dummy" or empty beehives. This method reduced the cost of building the fence and made it easier to maintain.

Over time, more and more farmers have implemented the beehive fences. Because beekeeping is a familiar tradition, the farmers are open to the idea. Furthermore, conservation groups work with farmers to encourage and teach beehive construction. Some farmers opt to invest in more expensive beehives that have separate compartments for honey and easy sections that lift out. Still others use simple log hives built from hollowed-out tree trunks, which cost nothing. The low cost and ease of construction make beehive fences accessible to all.

Sweet rewards

The beehive fences offer multiple benefits. Because they reduce conflicts between farmers and elephants, the fences make farming a safer occupation. The fences also lessen crop loss to elephants, which gives some farmers surplus produce to sell—a rare occurrence in the past. Making farming profitable enables farmers to improve their quality of life. The fences also deter the elephants without causing them any significant or lasting harm.

Keep reading >>

An Ingenious Solution, continued

Sweet rewards, continued

Beehive fences provide some indirect rewards, too. The bees serve the farmers by pollinating their crops. Furthermore, bees also keep the surrounding environment healthy by pollinating wild plants, which increases forage for grazing livestock and other animals. Farmers may also generate additional income through selling honey and beeswax.

An evolving experiment

While beehive fences made their debut in Kenya, news of their success traveled. In Tanzania, another African country, farmers experienced similar problems with the nearby elephants from the forest park stealing their crops. The farmers tried soaking cloths in oil and hot chili powder, which they attached to rope fences. The elephants did avoid the hot chili powder, but heavy rains regularly washed it away. Then farmers had the tedious task of constantly reapplying the powder.

Farmers began experimenting with beehive fences. Eventually, they formed a fence of over 100 hives between the park boundary and farmlands. They found that the probability of elephants damaging crops significantly decreased.

However, the fence did not eliminate the problem; the elephants crossed the fence where the dummy hives hung or in places where people failed to promptly mend broken fencing. Some elephants crossed the fence at night when the bees were less active. Further studies may lead to ways to manage these problems.

Beehive fences have also made an appearance in villages in India. In the town of Mayilattumpara, the weary residents had begun to give up on farming because elephant raids were constant. The villagers had

attempted to stop the elephants by beating noisy drums, growing tall plants, and even using solar-powered electric fences. Everything failed.

Based on the African beehive fence model, the farmers installed beehive fences along the border of their village for over a mile, placing hives every 33 feet. The fence project was an amazing success. Farmers witnessed increased crop growth given that elephants no longer trampled through their lands on a regular basis.

Today, the use of beehive fences continues to spread; people in 15 countries across Africa and Asia are testing versions of the fence. They must experiment to find a species of bees that can survive in their country with a sting that elephants fear. They must also constantly maintain and care for their hives. However, most people agree the fences are worth their efforts. By working with nature, they have found an effective and beneficial way to live in harmony with their enormous neighbor, the elephant.

P R O M P T

What are the “beehive fences” discussed in the text, and how are they an improvement for the farmers and the elephants? Use evidence from the text to support your response.

The Mysterious Life of Trees

More than meets the eye

Imagine wandering deep into an ancient forest of majestic trees. Over 1,000 years old, some of the towering pines have gnarled limbs like sculptures. Nearby, a massive oak with a lush green crown shades the ground. From its leafy litter, several young saplings unfurl hopeful, tender leaves.

It's easy to observe and appreciate the beauty of the trees, but these amazing plants also have some astonishing abilities that are not visible. Today, scientists are finding multiple ways in which trees "communicate" with each other.

Sending signals

Unlike living animals, trees cannot move to another location when threatened by hungry intruders. Instead, they must resort to other methods to fend off animals. One strategy that some trees employ is to release bitter chemicals into their leaves. However, the acacia tree goes a step further: it also warns nearby trees of impending attacks.

In Africa, the acacia tree is a popular food for giraffes; they can devour over 60 pounds of the leaves and twigs daily. To survive, the tree releases toxic tannins into its leaves, which makes the leaves hard for giraffes to digest. At the same time, the acacia emits another chemical, ethylene, into the air. The ethylene travels up to 50 yards, reaching other acacia trees in the vicinity with its distress signal. Instantly, the other trees begin to increase their production of tannins, too.

Giraffes are wise to the acacia's strategy. As a result, they frequently travel into the wind, so the trees' signals drift behind them. In addition, as they graze, the giraffes typically walk over 100 yards after nibbling on one acacia tree before sampling another. In this way, they reach a tree that has not yet received an airborne warning of their presence.

Other trees use their chemical signals to attract specific, helpful partners. For instance, when leaf-eating caterpillars infest elm trees, the trees send out a scent that attracts certain predatory wasps. The wasps deposit eggs in the caterpillars. After these eggs hatch, the wasp larvae devour the caterpillars and eliminate the tree's problem.

A family of trees

Trees do not send all their messages through the air; scientists are discovering an underground network of communication, too. While trees do compete on some levels with each other for resources, trees also form a cooperative forest "community" that supports their neighbors' growth and health.

How can a beech tree on a hillside offer any assistance to a fir tree on the nearby riverbank? Scientists have uncovered a complex system of tree roots connected by lacy threads of fungi. Fungi are tiny living organisms. They have no chlorophyll and cannot perform photosynthesis to make food. Therefore, they depend on tree roots to provide them with a source of sugar. In exchange, the fungi give the

SCIENCE

The Mysterious Life of Trees, continued

A family of trees, continued

trees minerals from the soil and water. More importantly, like a web of microscopic veins, the threads of fungi connect the tree roots of many different trees.

In addition to exchanging food resources, trees use their network to warn each other. For instance, if chewing insects attack an oak tree's leaves, the tree begins to pump tannins into them. At the same time, the oak sends a "news report" to other oaks through the underground web using chemicals and electrical impulses. Soon all the oaks in the area begin releasing tannins into their leaves.

Forests seem to contain large "mother" or "hub" trees that have highly linked networks and serve a vital role. Their larger size enables them to produce more food and to reach more trees, sometimes hundreds! Through their network, the hub trees send both food and warnings.

The presence of a hub tree is especially crucial for young seedlings. They often struggle for light to perform photosynthesis in the heavily shaded forests. Animals eat their leaves, insects attack, and the weather can frequently change. The hub tree sends resources to these struggling saplings. Research shows that the survival rate of seedlings is four times higher when hub trees are present. Hub trees seem to favor their own seedlings or "kin." They single them out and specifically send them resources.

A complex society

We have not yet learned all there is to know about how trees communicate with each other. For example, scientists are also beginning to explore how trees may use sound to communicate. While trees are not animals, they are complex living organisms that depend on each other. When we step into a quiet forest, we are truly venturing into a busy, bustling world. All around us, trees are speaking in 1,000 different languages.

P R O M P T

The text describes ways in which trees "communicate" with other trees. Describe at least two of the ways in which trees communicate with each other, and why they do this. Use information from the text to support your response.

Hexagons

Nature's ubiquitous shape

The hexagon is found in many places in nature. Honeycomb is one of the most common examples of hexagonal patterns and is probably the one that people think of most often. This six-sided polygonal shape isn't just limited to the interior of beehives. Hexagons are also found in snowflakes, dragonfly eyes, turtle shells, one-atom-thick layers of graphene, and even a giant storm on the north pole of Saturn!

Why do so many things have a hexagonal shape? Scientists aren't 100% positive, but they believe there are several possible reasons. The first is that nature is all about using materials efficiently.

Masters of efficiency

In the honeycomb, for example, it would seem silly to have wasted space where honey is not stored. The purpose of the honeycomb, after all, is to have as much honey stored in it as possible for the survival of the bees in the hive. If the honeycomb were shaped like a circle instead of a hexagon, large spaces in between the circles would be filled with wax. This environment would be inefficient for the bees for two reasons: one, bees don't eat wax, so having extra wax doesn't make sense; two, it takes bees a lot more energy to make wax than it does for them to make honey. Neither one of these is very efficient for the bees.

Efficiency characterizes all hexagons found in nature, not just in the honeycomb. Whenever there is space to be filled, nature wants to do it as efficiently as possible. Let's look at the dragonfly eyes for

another example. These colorful insects have compound eyes, which means they have many eyes. The eyes fit together into a hexagonal, honeycomb-type pattern. That structure allows more of the surface area to be covered with eyes than if it were filled with circles, triangles, or squares instead.

Strong shapes

Another reason that hexagons are used in nature is due to their strength. Regular hexagons are made up of six sides of equal length and six angles that measure 120 degrees. The shape is thereby also filled with six equilateral triangles. The triangles are formed by drawing lines from the center vertex to the outer vertices.

The equilateral triangle is an extremely strong shape—pressure applied to any of the triangle's sides spreads out evenly among the other two sides and all three of the 60-degree angles. Also, when you rotate an equilateral triangle, the vertices form an arch. An arch is one of the strongest shapes because at any spot where you apply pressure on an arch, the force is spread out across the entire arch.

Since the hexagon is made up of six equilateral triangles, it is stronger than one equilateral triangle. Apply pressure to any spot on the hexagon, and the force is equally distributed across the rest of the sides and all the 120-degree angles. It is also distributed through the center of the hexagon and then radiated out to all the sides.

Hexagons, continued

Tessellations

Some shapes can form tessellations, meaning they can be repeated next to each other in a line and never need another shape to fill in the gaps. Circles cannot form tessellations, as previously mentioned. When circles are placed next to each other, big gaps appear in between the rows. Equilateral triangles can be tessellated, and so can squares. But no other shapes can be tiled without another shape being added into the pattern to fill in the gaps.

The reason the ability to form tessellations is valuable is that it allows for further efficiency. It doesn't make sense for nature to have to find multiple, different shapes to repeat in a pattern when one shape alone can achieve the same purpose.

Molecular hexagons

Hexagons aren't just found in nature in things that we can see with our eyes. They are also found in atomic and molecular structures. Graphene, for example, is a single one-atom sheet of the mineral graphite. This mineral is made completely out of carbon, and the carbon atoms are arranged in a hexagonal honeycomb shape. This hexagonal shape contributes to the fact that graphene is one of the strongest materials currently known to humans. It is between 100 and 300 times stronger than steel!

A snowflake is another example. All snowflakes have hexagonal shapes at their cores. When two water molecules freeze, they form a hexagonal shape. This shape gets added and added to until it forms the center of a snowflake.

Hexagons outside nature

Hexagons are found not only in nature but also in human-made objects and structures. The geodesic dome is an example of a hexagonal structure. The soccer ball is covered in hexagons! And look at your pencil—it is made in a hexagon shape, too.

What other shapes from nature or architecture or other human-made objects can you think of that contain hexagons?

P R O M P T

The text discusses the presence of hexagons in nature. Describe two likely reasons why the shape is found so frequently in nature. Use information from the text to support your response.

An Engineering Marvel

Connecting the Great Lakes to the Atlantic

A merchant named Jesse Hawley envisioned the construction of a grand canal linking the Great Lakes to New York City. His business had gone bankrupt because he had no efficient way to transport flour from his farm near Rochester, New York, to New York City. Hawley published a series of essays in which he detailed a possible route and the potential benefits of building what would later be called the Erie Canal.

New York Assemblyman Joshua Forman supported Hawley's dream. In 1808, he even traveled to Washington to seek funds from the United States federal government for the project. However, President Thomas Jefferson called his proposal "a little short of madness." Jefferson suggested that men might consider building the canal in 100 years when they had gained more engineering skills and knowledge.

Another prominent New York politician, Senator DeWitt Clinton, joined the drive for a man-made canal. He predicted the canal would help New York City become "the granary of the world, the emporium of commerce, the seat of manufacturers, [and] the focus of great moneyed operations." Still, many argued that it was not possible. They nicknamed the plan for a canal "Clinton's Big Ditch" and "Clinton's Folly."

In spite of the controversy, Clinton's campaign for the canal succeeded. The New York state government narrowly passed a bill that authorized \$7 million for the project. The proposed canal would stretch eastward 363 miles from the city of Buffalo, located on Lake Erie, to Albany. At Albany, ships could enter the Hudson River and travel south to New York City, a port on the Atlantic Ocean. At last, there would be a path that connected the Great Lakes to the Atlantic.

Facing challenges with invention

On July 4, 1817, workers dug their shovels into the ground in Rome, New York, to begin excavating the canal. Laborers had to depend on simple tools such as shovels, axes, and wheelbarrows to do the job, since machines like bulldozers did not exist. The project leaders had little experience or education to guide them. At that time, there was only one engineering program offered in the entire country.

The first section of the canal cut through sandy terrain. The men dug a ditch that was 4 feet deep and 40 feet wide. When the ground was soft, the workers needed nothing but a spade and wheelbarrow to move the earth. However, the wheelbarrows at that time had rectangular shapes and vertical sides that made them clumsy and difficult to use. Before long, a man named Jeremiah Brainard molded some ash wood into a new wheelbarrow design with a round basin. The improved model allowed muck to slide out swiftly, and it was lighter and easier to maneuver. Soon Brainard was selling his wheelbarrows all along the canal line.

Construction problems required creative answers, too. The project engineers had to find a way to accommodate the constant changes in elevation along the canal's path. Originally, Hawley had suggested that the canal would work like a giant inclined plane. However, this notion would require the canal to run on top of a towering mound at the outset, over 100 feet above the ground. Instead, the project leaders chose to use a system of locks to navigate the changing levels in elevation. Europeans had already successfully used locks for hundreds of years in their canals.

An Engineering Marvel, continued

Facing challenges with invention, continued

Locks work like “hydraulic” elevators. Each canal lock, or chamber, contains two gates. When a boat nears, an operator opens the gate to allow the boat to enter the chamber. If that boat is traveling toward a section of the canal at a lower level, the operator then opens a gate to drain water from the chamber and lower the boat. On the other hand, if the boat is traveling toward a higher section of the canal, the operator opens a gate and allows water to flow into the chamber and raise the boat. In the Erie Canal, the men needed to build 83 locks to handle all the changes in elevation.

The construction of the Erie Canal also called for another necessary invention—waterproof cement. While ancient Romans had used volcanic ash to create a type of this cement, importing ash was too expensive to consider. Andrew Bartow, an educated farmer, began experimenting with limestone, which is the main ingredient in cement. In time, he discovered a clay-like limestone that he heated to a high temperature. This changed the limestone’s hardness. When mixed, this new hardened limestone made the cement waterproof.

In 1825, the Erie Canal was completed. Laborers had fought their way through swamps and cleared paths through dense forests. They had bridged rivers and blasted apart rocks. To celebrate, DeWitt Clinton, now the governor of New York, traveled by boat from Lake Erie to the Atlantic Ocean near New York City. He poured some of Lake Erie’s waters into the sea, proclaiming a “wedding of the waters.”

Far-reaching impacts

The completion of the Erie Canal had dramatic effects on America. First, a consumer economy developed. For the first time, farmers, loggers, and other merchants could profitably send products eastward from the resource-rich Midwest to New York City. For example, barges carried freight on the canal for \$10 a ton as opposed to the \$100-a-ton fee that horse-drawn wagons charged.

Because of New York’s direct access to the Midwest, the state evolved into a gateway for commerce. New York’s population quadrupled between 1820 and 1850, and soon it outranked New Orleans as the largest port in the country. Its nickname became “the Empire State,” and most European immigrants entered the country through New York.

The Erie Canal also served as a “highway” for settlers. While many towns sprang up in New York along the canal, pioneers also used the canal’s direct route as the first leg in their journey to frontier lands. The waterway allowed people to settle in areas that were formerly almost unreachable or were only reachable through arduous journey.

In 1834, to accommodate the large volume of traffic, laborers widened the Erie Canal’s channel to 70 feet and deepened its trench to 7 feet. About two-thirds of all western products flowed through the canal to their markets, and most travelers journeyed west on the canal, too.

SOCIAL STUDIES

An Engineering Marvel, continued

Far-reaching impacts, continued

The great era of the Erie Canal lasted through the 1880s, but the arrival of railroads caused another change. People could finally ship freight overland effectively; passengers could ride in trains. In 1959, the completion of the St. Lawrence Seaway caused another reduction in the canal's shipping traffic. The new seaway offered a channel for large ships to enter the Great Lakes directly from the Atlantic Ocean.

In 2000, Congress designated the Erie Canal as a National Heritage Corridor. Tourists can visit and walk along the paths lining the canal where mules once pulled barges. While barges no longer carry freight on its waters, the Erie Canal remains as a lasting testament to America's "can-do" spirit and its ingenuity.

P R O M P T

The construction of the Erie Canal involved persistence and invention. Describe two examples of invention that are discussed in the text, and which problems they solved. Use information from the text to support your response.

In Plain Sight

The phrase “hiding in plain sight” suggests that the best place for concealment is somewhere obvious. People will look past whatever is blatantly not hiding, rarely suspecting what’s right in front of them.

Professional spies are trained in deception and concealment. For field agents who secretly collect information on an enemy or competitor, hiding in plain sight can be especially useful.

Yet while spies are trained to deceive, they are recruited for their trustworthiness, among other things. This may seem odd, but the fact is that most spies truly believe that they are working for the right side and the greater good. Personal convictions like these can persuade even unlikely people to become spies. For example, approximately 1,000 girls and women spied for both sides during the American Civil War.

One of the most effective Civil War spies was Mary Elizabeth Bowser. As an African American, Bowser was a free person in 1860 when the war began between the Union (“the North”) and the Confederacy (“the South”). Mary Bowser was clearly motivated to help the North win the war, and she had the personal qualities that make for an extraordinary spy. Moreover, Bowser was well educated and had good acting ability. Given that spying is notoriously risky work, she was also brave. Perhaps most importantly, Bowser had an excellent memory. By some accounts, it may have been nearly photographic.

Much of Bowser’s story is shrouded in mystery. What historians generally seem to agree on is that as a Union spy, Bowser’s cover identity was Ellen Bond, a quiet, illiterate housekeeper. Astoundingly, the Union’s spying leaders were able to place Mary in the Richmond, Virginia, home of Jefferson Davis, the president of the Confederacy. This was the Confederate White House of the South!

In her role as a servant, Bowser took hiding in plain sight to a new level—and it worked. The Davis family and their guests treated the housekeeper as if she were virtually invisible. In her role, Bowser knew that the key was for everyone to assume that she was who she said she was and that she posed no threat to anyone. While at work cleaning areas like the president’s studio, historians assume that Bowser read the letters and strategies that he left out on his desk. While serving meals, she could listen in on conversations about military strategies and troop movements. The assembled Confederates apparently had no idea that the unassuming housekeeper diligently memorized everything they said.

Bowser then needed to relay what she’d learned to a nearby spy who could pass word along. It is believed that her contact was a local baker named Thomas McNiven, who made frequent trips to Jefferson Davis’s home. According to one source, McNiven said that Mary Bowser provided some of the most critical information of the Civil War.

As the war went on, Jefferson Davis and other rebel leaders reached the conclusion that the Union had inside information about their troop movements, prisoners, and government operations. They eventually deduced that someone on Davis’s staff could be the security leak. Even under heightened suspicions, Bowser was able to avoid detection until nearly the end of the war.

SOCIAL STUDIES

In Plain Sight, continued

In January 1865, Jefferson Davis was apparently alerted that Bowser was a suspected spy. Bowser fled, and the Civil War ended a few months later. The practice of slavery in the United States officially ended in December 1865. This event must have been personally very moving for Mary Bowser. After all, Bowser had been born a slave herself before being freed by her owner when she was 12 years old.

After the war, Mary Bowser worked in Virginia to educate newly freed slaves. She also spoke in public under different assumed names. Unfortunately, we may never learn the full story of Mary's wartime heroism or her later life. That's because after the Civil War ended, the US government destroyed all its records relating to Union spies, including Mary. The reason was to protect the spies from possible revenge if their real identities were revealed to the public. Ironically, the woman who hid in plain sight has proven elusive to modern analysts who want to understand her legacy.

What effect did Bowser's work have on events outside of the Confederate White House? This is difficult to establish, yet historians agree that Mary Bowser was one of the most important Union spies. Without her, the Civil War might have stretched on longer and cost more lives. In recognition of her bravery and resourcefulness, Mary Bowser was inducted into the Military Intelligence Corps Hall of Fame in 1995.

P R O M P T

What made Mary Bowser an effective spy, and how did she contribute to the success of the Union during the American Civil War? Use information from the text to support your response.

Discovering Hidden Treasure

“I’ll never make it all the way to the top,” Max told his uncle Michael in a wavering voice as they paused to rest on the mountainside. “My legs already feel like noodles, and the mosquitoes are attacking every inch of my skin.”

Uncle Michael stared at the craggy peak towering in front of them as if he were regarding an old friend.

“It’ll be worth the effort,” Uncle Michael encouraged Max. “Put on your hooded jacket to guard against the mosquitoes—we need to keep moving if we’re going to reach the summit before nightfall.”

Grumbling, Max yanked his jacket from his backpack and thrust his arms through the sleeves. He did not want to be hiking on the craggy, wooded mountain trail, but his parents had to travel for their antique business, and Uncle Michael had invited him to visit. Unfortunately, Uncle Michael was like some modern-day Daniel Boone, constantly exploring the forests near his home, while Max definitely preferred civilization.

Later, when Uncle Michael stopped with Max near his favorite stream to fish, Max awkwardly cast his line into some thick bushes.

“I can’t fish,” Max sighed, snapping his line as he relentlessly tugged at it. His uncle ignored him; he was too busy reeling in a sparkling trout. Sullenly, Max plopped down on the bank to watch.

Max’s attempts at other outdoor skills were no more successful; he found nothing but barbed, spiny thistles when he searched for blackberries, and he could not coax a single stubborn spark from the dry tinder his uncle collected for their fire.

“I can’t do any of this stuff,” Max said, tossing the flint on the grassy ground with frustration.

Uncle Michael’s eyes narrowed, and, after a moment’s pause, he started rummaging through his backpack, extracting a small trowel. Next, he gathered a fistful of tiny rounded pebbles. As Max observed him, he briefly wondered what kind of impossible task his uncle would expect him to perform next.

“I want you to bury these stones for me,” Uncle Michael requested.

“Why?” Max asked, mystified.

“Each one of those stones represents one of your ‘I can’t’s,” Uncle Michael declared, “and I want you to dig a hole and bury them. I don’t want to hear you use those words again. Instead, use your imagination and try to replace every ‘I can’t’ with something that you can do. If you promise to stop using those words this week, I’ll promise not to drag you into the woods again for the rest of your stay—deal?”

Vigorously, Max nodded. Then he stuck the trowel into the rocky ground and almost hollered, “I can’t dig a hole here!” Catching himself, he clamped his lips together, surveyed the area, and discovered a sandier location near some daisies. With great ceremony, he scooped out some earth, dropped the stones into the hole, and covered them.

After they finished their lunch, Uncle Michael led Max along the last leg of the zigzagging trail. They had clambered over some boulders, waded across a stream, and fought through a thicket. Each time, Max had automatically wanted to declare, “I can’t do that,” yet he kept clamping his lips together and doggedly following his uncle. With an unsettling clarity, he began to realize how often he used those words for an easy excuse.

Keep reading >>

Discovering Hidden Treasure, continued

Finally, tired and bedraggled, Uncle Michael and Max reached Mount Thorne’s overlook. Max felt a sense of both reward and accomplishment as he surveyed the countryside. It stretched out below them like an enormous patchwork quilt knit together with threads of rivers and roads. Already, the sun was sinking toward the edges of the horizon, coloring the sky with hazy fingers of orange, gold, and pink.

That evening, as Max and Uncle Michael studied the starlit canopy arching above them, the magical night seemed to inspire dreaming.

“If I really could do anything, I’d like to travel to China and visit Beijing,” Max confessed to his uncle, surprising them both. “My mom told me that my great-great-grandfather Chao lived there long ago.”

“That’s a fine ambition,” Uncle Michael said companionably.

“Thanks for bringing me here,” Max told him next, “but remember, I’m retiring from hiking after this trip,” he added.

Uncle Michael chuckled, and then they nestled into their sleeping bags and drifted to sleep.

The next morning, when they returned to Uncle Michael’s house, Max emptied the leftover supplies from his backpack and sprawled blissfully on the carpet in front of the television. An hour later, his uncle interrupted his second episode of *Secret Spies*.

“Let’s go to town. I want to take you someplace interesting—and it’s not in the woods,” Uncle Michael asserted before Max could refuse.

Twenty minutes later, Uncle Michael parked in front of a historic brick building, which was Mason Lake’s public library. Hoping there was some kind of amazing exhibit inside, Max traipsed after Uncle Michael again.

“*This is your interesting place?*” Max squawked when he opened the front door—nothing but tables of computers and shelves of books greeted him.

“I thought it was time for you to start researching for your future trip to China,” Uncle Michael said, and he handed Max a notebook.

“I . . .” Max stuttered, opening his mouth to protest, but he swiftly stopped himself from uttering his usual mantra, especially since his uncle never tired of hiking.

“I have to attend a city council meeting in the conference room, but I’ll be done in an hour,” Uncle Michael explained, logging Max in at a computer.

As his uncle strolled away, Max sat down at the computer, feeling an unexpected nudge of curiosity. He could at least type in “Beijing” and read about the city.

Before long, Max found a website about the Forbidden City in Beijing. The Forbidden City earned its name because it held the Imperial Palace. Centuries ago, laws barred most subjects from entering its 114 royal buildings. In fact, only the emperor had complete access.

Discovering Hidden Treasure, continued

Next, Max stumbled across a newspaper article about the discovery of an army of terra cotta soldiers. In 1974, workers uncovered thousands of the life-size clay statues buried in the ground with their chariots and horses! Archaeologists suspected that the ancient Chinese people buried the statues to accompany their first emperor into the next life when he died.

“Are you working on a report about China for a summer class?” the librarian, Ms. Smyth, asked, pausing by Max as he scribbled down notes. “Perhaps I can help you.”

Max glanced up, hesitating, before he admitted, “I’m reading about China because I want to travel there. I mean . . . maybe . . . one day.”

Ms. Smyth stared at him thoughtfully and said, “I have just what you need. I’ll be back in a minute.”

Soon Ms. Smyth reappeared with a pamphlet and an enthusiastic expression lighting her face.

“There’s a student exchange program for seniors in our state that offers them a chance to study in China,” Ms. Smyth explained. “Here’s some information that lists the requirements and guidelines. You have several years to prepare if you’d like to apply,” she continued, “and I’d be happy to help you in any way.”

Max felt a spark of excitement ignite inside him, and his heart skittered in his chest—his dream could become a reality! For the first time, he started to comprehend the invisible but tremendous force in his uncle’s “I can” philosophy. His hands trembled as he accepted the pamphlet, asking Ms. Smyth what she recommended he do first.

When Uncle Michael eventually returned to the reference area, Max shot across the room to greet him.

“I’m going to sign up for Chinese language classes this fall at the community center,” Max announced, “and I want to check out this book on the Forbidden City. In four years, I’m going to apply to be an exchange student so I can go to China. Did you hear that—I can!”

“That’s the song I prefer,” Uncle Michael praised, laughing aloud.

“Yeah,” Max declared with a grin. “I’m starting to really like those lyrics, too.”

P R O M P T

How does the character of Max develop and change throughout the text, and what is Uncle Michael’s role in how Max changes? Use evidence from the text to support your response.

Getting It Right

“Ready to get started, Melissa?”

Melissa grinned, nodding so vigorously that her blonde pigtails swung. Melissa was my first charge as part of Pineville Middle School’s Top Tutors Program, a brand-new volunteer program pairing eighth-graders with elementary school students who needed some extra academic help.

I knew from the start that I was perfect for this program, so it was no surprise to me when my school counselor, Mrs. Chin, approved my application for a tutoring position. After all, I am Ramiro Reynolds, the kid who excels in every subject. Even when Mrs. Chin conducted the training sessions, I could tell I was catching on more quickly than everyone else. Sitting alongside Melissa in our public library’s children’s section, I was positive I would have no difficulty helping a little third-grader with her language arts homework.

“Nouns, adjectives, and verbs may seem difficult now,” I began with a smile, “but they’ll be super simple once you learn them.” Melissa continued to grin confidently. “So, can you tell me what an adjective is?”

Her smile evaporated in the blink of an eye. “Uh . . . something you can see?” Melissa replied, her voice nearly inaudible as she tucked her chin into her chest.

“Not exactly. An adjective describes a noun. A noun is a person, place, or thing. A verb is an action word. For example, ‘The blue ball bounced.’ See what I mean?” Melissa stared at me quizzically. “It’s just like your workbooks says.” I flipped the pages, reading each definition a second time.

Melissa’s attention shifted to a model of the solar system suspended across the room. “I like science better,” she said.

“Yeah, science is fun,” I agreed, “but your teacher says that you need some help with language arts and that we should work on parts of speech. Can you give me an example of a noun?”

Gazing all around the children’s section, Melissa finally pointed. “That blue chair?”

“Kind of. The chair is a noun, but blue is an adjective because it describes it.”

“Do you know that Mars is called the Red Planet?” Melissa asked, her eyes lighting up.

“Yes, I do, but . . .”

“I can name all the planets, can you? Mercury, Venus, Earth . . .” she recited, enumerating on her tiny fingers.

“Melissa,” I said loudly enough that Mr. Barnes, the children’s librarian, glared from around his monitor. “Come on, concentrate. I’m here to teach you about nouns, adjectives, and verbs. Now, name an adjective.”

Looking panicked, Melissa stammered, “A . . . d-dog?”

Getting It Right, continued

I sighed heavily, shaking my head. In my backpack, I had two tests with perfect scores and an essay with the comment “Spectacular, Ramiro!” scrawled in red pen. When I was Melissa’s age, my work constantly received stickers saying, “Terrific job!” I learned the difference between nouns, adjectives, and verbs in one minute. How could Melissa not understand it?

“We learned about dogs in science,” Melissa told me. “There are tons of different breeds, like poodles, beagles . . .”

“Melissa, you need to focus on language arts, or you’ll never learn it. Tell me a word that’s a verb.”

She gazed at me as if I had asked her to write an essay on every play William Shakespeare had ever written.

The rest of the afternoon went on this way. Occasionally, she answered correctly but could not seem to get two correct answers in a row.

When Melissa’s dad picked her up, I was not only exhausted but happier than if I had won a million dollars—until I remembered I would have to go through this all over again in a few days from now! Why had I gotten myself into this?

That evening while we were making dinner, Mom taped my perfect tests on the refrigerator and congratulated me on my essay before asking about my first tutoring session.

“This kid Melissa just doesn’t get it,” I griped, stirring the spaghetti sauce so furiously that I splattered some on the counter. “The work isn’t that hard, but she can’t grasp it. I never had problems like that when I was in elementary school.”

“No, you’ve always found academic work easy, and that is one of the qualities that earned you this tutoring position. Just stick with it, Ramiro. She’ll get it right.”

The following day, my mind ran in circles thinking about Melissa and our miserable tutoring experience. I was still thinking about her at the beginning of science when Mrs. Anderson handed back my first lab report with a big red note scrawled across the top. I looked down, expecting to see the words “Fantastic job, Ramiro” or “Well done—as usual,” but I was as startled as if the fire alarm had sounded. The comment read, “See me.”

When I approached her desk at the end of class, Mrs. Anderson said, “Ramiro, I don’t think you fully understand how to write a lab report yet, but that’s okay because they can be difficult when you’re first learning to do them.” Then she used words like “hypothesis” and “conclusion,” explaining how they needed to be related. Although Mrs. Anderson patiently explained what she had already taught us a few days ago, I was still confused. I did not want to admit it, so I simply agreed to rewrite the report that night.

What a monumental mistake! At 11:00 p.m., I was still working on it when Mom knocked on my bedroom door to ask why I wasn’t asleep. “I don’t understand this at all,” I blurted, now in a bleary-eyed panic as I explained the situation.

Mom listened, finally replying, “Get some sleep, Ramiro, and we’ll work on this tomorrow before breakfast, okay?”

Getting It Right, continued

The next morning, Mom explained things a little differently than Mrs. Anderson. I understood the concept of lab reports a bit better, but not entirely. Mom promised to help me again tonight, suggesting I also ask Mrs. Anderson for additional assistance after she read my revised report.

As my mind raced over my problem, I thought back to Melissa—Melissa looking confused, Melissa barely wanting to answer my questions, Melissa listening to me become more and more impatient.

To make matters worse, my second tutoring session with her was that afternoon. The confident smile she initially wore had disappeared. Again, she stared at the model of the solar system suspended from the ceiling. Without knowing it, she gave me an idea.

“Melissa, what’s that?” I indicated one of the orbs.

“That’s easy. The moon. Everybody knows that, Ramiro.”

“Do you know anything that’s up on the moon?”

“You mean, like craters?” she asked. “The moon is a place I’d like to visit someday, like the astronauts did.” Her mouth hung open. “Hey, the moon is a place. Craters are things. Astronauts are people. They’re all . . . nouns!”

I quickly pointed out the window. “See that dog? Describe her.”

“She’s a German shepherd. She’s big and strong, with brown and black fur. The dog’s running.” Melissa’s face brightened. “The words that describe the dog are adjectives. And ‘running’ is what the dog’s doing—a verb!”

We used the plants in the nonfiction section, the flowers in the flowerbeds, and even the water from the water fountain—anything and everything science-related. By the end of our session, Melissa was getting nearly every question right, and she was smiling again.

When her dad picked her up, she was still shouting out nouns, adjectives, and verbs. She stopped long enough to say, “Daddy, Ramiro figured out how to make me get it!”

Shaking my hand, her dad said, “You must know what it’s like.”

I smiled and made a mental note to speak to Mrs. Anderson tomorrow.

P R O M P T

How does Ramiro’s tutoring work with Melissa cause him to change? What does he learn about himself throughout the course of the text? Use evidence from the text to support your response.

SECTION C

Texts Worthy of Text-Dependent Analysis



Keeping Time

Local time

For hundreds of years, people had one surefire way of telling time—they would crane their necks and look up at the sky. When the sun was directly overhead, straight up in the sky, it was high noon, or 12:00 p.m. sharp.

Historically, most towns, villages, and cities in the world set their clocks using this “local time” method. That meant that towns just a few miles apart from each other would have their clocks set at different times. One might be 10:45 a.m. while the other was at 10:51 a.m. Using this method also meant that the time on the clocks constantly needed to be changed and adjusted since the sun didn’t arrive at high noon at the exact same time every day.

This local time system worked just fine for centuries, even millennia. That’s because people didn’t travel very far from their hometowns, and even if they did, the exact time in another place didn’t really matter. The time only mattered in the place where a person was currently located.

Inefficient timekeeping

In the late 1800s, life in the United States seemingly revolved around the railroad. Everything—food, merchandise, machines, and people—were moved long distances via rail. The railroad therefore demanded a tight schedule to run efficiently. It soon became evident that the local time method was completely inadequate for such a complicated transportation network.

Imagine how challenging it would be to use the local time system to move people and freight efficiently by rail. A departure time of noon in Omaha, for instance, could have numerous departure and arrival times depending on the local time of any given city. People receiving goods in faraway places had to constantly ask, “What time did that shipment really leave? When can we expect it?” To answer those questions, the railroad had to make complicated timetables.

Standardizing time

The inability to pinpoint exact departure and arrival times threatened to cripple the rail network in both the United States and Canada. Not only did it create a scheduling nightmare, but it also caused serious safety issues on tracks. Since more than one train often used a single line of track, it was imperative that the railroad companies knew exactly where their trains were located during every second of the rail journey. Otherwise, collisions could result.

The idea of standardizing time was taken into serious consideration in North America in the 1880s. Interestingly, it wasn’t the government in the United States or Canada that ultimately decided to adopt the standardized time zone system—it was the railroad companies. They knew they had to standardize time across their network to be more efficient and effective.

November 18, 1883, was the first day of the railroad’s new time zone system in the United States. Since the railroads were an integral part of society, people were more than happy to adapt the railroad’s new

Keeping Time, continued

Standardizing time, continued

time system to other aspects of their lives. Railroad time soon replaced local time across North America. Thirty-five years later in 1918, the US Congress officially adopted the system, and it's still the method of telling time that's in use in the country today.

US time zones

The United States has six time zones: Eastern, Central, Mountain, Pacific, Alaska, and Hawaii. These are the standard time zones. They are each one hour apart from each other.

In the United States, most of the country also observes something called daylight saving time. In the spring, people turn their clocks forward one hour (spring forward), and in the fall they turn their clocks back one hour (fall back). Daylight saving time was intended to give people better use of the daylight hours and help them conserve more energy. Nearly half of the rest of the world follows daylight saving time, too.

A few places in the United States do not change their clocks for daylight saving time in the spring, but instead stay on standard time throughout the year. The states of Hawaii and Arizona plus the US territories do not follow daylight saving time.

Some states are split into several time zones, and Nebraska is one of them. About half of the state of Nebraska (the eastern half) is in the Central Time Zone while the other half (the western half) is in the Mountain Time Zone. This difference means that when it's 2:00 p.m. in Lincoln, it's 1:00 p.m. in Imperial.

Global time zones

Globally, the earth is divided into 24 time zones matching a day's 24-hour increments. Time starts at the prime meridian, which is 0 degrees longitude. The town of Greenwich, England, is located directly on the prime meridian. The time that shows up on your watch is directly determined by what time it is in Greenwich. This is how it works.

Let's say you live in New York City, which is in the United States Eastern Time Zone. This zone is five zones to the west of Greenwich. So if it is 7:00 a.m. in Greenwich, it is 2:00 a.m. in New York. Now imagine that you live in Berlin, Germany. This town is to the east of Greenwich in the Central European Time Zone. That means that it is one hour ahead of Greenwich. When it is 7:00 a.m. in Greenwich, it is 8:00 a.m. in Berlin. If a town is to the east of another town, the sun rises there first. Therefore, it makes sense that it is 8:00 a.m. in Berlin when it is still 7:00 a.m. in Greenwich, which is located farther to the west.

Time zones have brought a great deal of order to our world. While figuring out time differences between cities or countries may sometimes be challenging, our current system no doubt brings structure and logic on which we all rely.

Nature's Gold: Mathematics in Nature

The Fibonacci sequence

What do sunflowers and pineapples have to do with mathematics? They are all structured in spiral patterns that follow a mathematical formula called the Fibonacci sequence.

The Fibonacci sequence is a number sequence that begins with the numbers 0 and 1, and then grows larger through a series of addition problems. In the Fibonacci sequence, each number (after the first two numbers) is the sum of the two previous numbers.

The first problem to solve is $0 + 1 = 1$. The sum gives us the next number in the sequence. Then, to get the next number, we add the last two numbers in the sequence, which are now 1 and 1. So $1 + 1 = 2$. That means that the next number in the sequence is 2. The next problem to solve is $1 + 2 = 3$ followed by $2 + 3 = 5$. By this point, the number sequence looks like this: 0, 1, 1, 2, 3, 5. Continuing this pattern, the next two numbers to be added are $3 + 5$, which makes the next number in the sequence 8. This process continues to infinity.

Natural applications

The individual Fibonacci numbers from the sequence are also found in nature. For example, buttercups have 5 petals, roses have 13 petals, asters have 21 petals, and daisies can have as many as 89 petals. All these numbers are Fibonacci numbers.

The number of spirals in particular objects in nature also corresponds to the individual Fibonacci numbers. For example, if you look at a pineapple, a pine cone, or a sunflower, you'll see that their seeds are placed in a series of spirals. If you count these spirals from any direction, your answer will always be a Fibonacci number.

Golden Fibonacci

The Fibonacci numbers are also directly related to other mathematical concepts, the golden ratio and the golden angle. The golden ratio is an irrational number discovered by the Greeks and is also known as Phi. This ratio relates to a rectangle that is said to be the most pleasing to the eye—the golden rectangle. The ratio is found by dividing the length of the rectangle by its width to obtain the irrational quotient 1.61803, which goes on forever. The golden rectangle is used in architecture and art.

Guess what happens when you divide a Fibonacci number by the number that precedes it? Yes, you always get Phi! Furthermore, if you divide a circle using the golden ratio, the smaller of the two angles formed is 137.5 degrees. This is the golden angle, which once again you can calculate using the Fibonacci numbers.

Golden angle in nature

The golden angle is found in many plants. Nature is all about efficiency and wants to use available space as appropriately as possible. Therefore, a plant isn't going to grow with all its leaves, petals, and seeds stacked on top of each other. That wouldn't make sense for the efficiency of the plant and its ability to grow, reproduce, make food, and survive. This is how the golden angle comes in handy.

Consider a new plant as it begins to grow. It has one leaf on its stem. Where will the second leaf most likely grow? You may think that the best place for it to grow to be balanced on the stem would be directly across from the first leaf, or 180 degrees away. However, if the leaf grew there, then the third leaf would also grow 180 degrees from the second

Keep reading >>

Nature's Gold: Mathematics in Nature, continued

Golden angle in nature, continued

one, which would put it right on top of the first leaf! The leaves would continue to stack on top of each other as they grew up the stem, which would not allow the plant to best maximize its space and absorb the most energy from the sun.

Let's say the leaf grew 120 degrees away from the first one. That works for the first three leaves, but then by the fourth leaf, the leaves begin to stack on top of each other. So 120 degrees won't work either. Try this for any rational number, and the result would always eventually be the same: the leaves, petals, or seeds would eventually stack.

Back in the 1830s, botanists found that leaves are arranged at a precise angle around a circle. This angle allows the leaves to keep growing around and around the plant in a spiral pattern with the leaves never landing on top of each other. This angle is based on an irrational number, or an uneven fraction. And as you might have guessed, this angle is 137.5 degrees, the golden angle.

Nature by design

The Fibonacci numbers are fascinating because they show that things in nature don't grow in a willy-nilly fashion. Rather, they grow using specific mathematical formulas built somehow into their DNA. This sequence allows nature to grow in a way that is both advantageous and pleasing to the eye.

Jeannette Rankin, the First US Congresswoman

Jeannette Rankin's upbringing on a ranch in Montana in the late 1800s may have instilled in her the grit and determination she would draw on later in her life as a suffragette. The West was a wild place during Rankin's childhood, a rugged region where hard work was expected from everyone, male and female. Every member of a family was needed to work—to farm the land, raise crops, round up cattle, build fences, gather water, and protect the property and the people who dwelled on it. Therefore, the residents of this part of the country were more inclined to feel that women should be treated as equals of men, especially in the voting booth and in politics.

Jeanette Rankin began fighting for women's suffrage in the early 1900s while a graduate student in the state of Washington. She returned to Montana shortly thereafter and began promoting voting rights for women in her home state. She gave speeches and organized other suffragettes. Her efforts were well received, and well rewarded. In 1914, women in Montana received the right to vote.

In 1916, Rankin decided to run for the US Congress as a representative from Montana. She was well respected in the state due to her work as a suffragette. She also had financial backing from her brother. In 1916, only a few states had granted women suffrage, so to run for a federal office seemed groundbreaking.

Rankin ran her campaign on a very specific platform. First, she was in favor of a constitutional amendment that gave women the right to vote. Second, she was against going to war. Rankin felt very strongly about both issues and planned to stand her ground on both.

She ran a tough race, and in the end she won! By doing so, she became the first female member of Congress.

On her first day in Washington, DC, in April 1917, she listened to President Woodrow Wilson give a speech to Congress. In his speech, he asked the legislators to vote in favor of going to war with Germany to "make the world safe for democracy." In Rankin's first vote as a congresswoman, she voted no since she was strongly against war. She wasn't the only one. About 50 other members of Congress voted the same, but the majority of Congress voted to enter World War I.

Rankin worked hard during her two-year term in office. In January 1918, she was the congressperson who opened the floor to debate on the topic of women's suffrage. In her speech, she asked the members of Congress how they planned to explain to the suffragettes "the meaning of democracy if the same Congress that voted for war to make the world safe for democracy refuses to give this small measure of democracy to the women of our country?" Rankin's argument helped the resolution pass in the House, but it died in the Senate. However, in 1920, the 19th Amendment to the Constitution was ratified, giving women the right to vote. Although Rankin had left Congress by then, her efforts as America's first congresswoman certainly helped in its passing.

Rankin would eventually serve another term in office in 1940 as a member of the US House of Representatives. That meant that she was in office during another crucial war vote—the vote to declare war after the bombing of Pearl Harbor in December 1941. Once

SOCIAL STUDIES

Jeannette Rankin, the First US Congresswoman, continued

again, Rankin voted no to the war declaration. This time, though, she was the only member of Congress to do so, and her vote was very unpopular throughout the country. However, she stood by her convictions and voted accordingly.

Years later, Rankin continued to speak out against issues she felt strongly about. She didn't agree with the Vietnam War. At age 88, she organized and led a protest rally in Washington, DC, against the Vietnam War. She continued to be a woman of strong convictions. Even in her last days, she talked about running for Congress as an antiwar candidate from Montana. She died at age 93.

A Drama

With hunched shoulders and dry lips, I stammered, “To be a member of the House of Representatives, you have to be at . . . at . . . at least 25 years old.”

I was attempting to give a speech to my eighth-grade class for Career Day, but the roomful of curious eyes staring at me felt more like lasers pinning me to the wall. For the next five minutes, I struggled through the remainder of my speech. Finally, I collapsed into my seat with an immense flood of relief. I have my talents, but unfortunately, speaking in front of a group is not on the list.

When class ended, Mrs. Lahti, my English teacher, glanced in my direction and asked, “Mario, could we talk for a moment?”

I figured Mrs. Lahti wanted to discuss my dismal performance, and I heaved a sigh as I trudged toward her desk.

“I know I flubbed my speech, but I really did practice it,” I announced, defending myself before she could comment.

“I’m sure you did,” Mrs. Lahti acknowledged, “but I wanted to speak with you about the Drama Club. I’m the coach this year, and I’d like for you to consider joining us; our first meeting is after school today in the library.”

My mouth dropped open; people in the Drama Club performed on the auditorium stage in front of a humongous crowd, and I could hardly breathe when I spoke to a classroom full of kids. Still, as Mrs. Lahti stared at me with an optimistic, expectant look on her face, my head gave an automatic nod, though my brain screamed no!

When the final bell rang that day, I trudged down the hall and into the library with faltering steps. Like a shadow, I slipped into a seat around the table where the Drama Club had gathered. Everyone was eagerly chattering about this year’s production, *The Adventures of Tom Sawyer*. When Mrs. Lahti passed out the scripts, she gave me one, silently endorsing my presence with an enthusiastic thumbs-up.

Biting my lip, I rifled through the script, staring at the different parts and searching for the one with the least amount of lines. Maybe I could be a townspeople, I thought hopefully, and do nothing but stand in the background.

“Auditions are next week,” Mrs. Lahti announced as the meeting ended, “and there are enough speaking parts for everyone,” she added, glancing pointedly in my direction.

I felt a wave of irritation as I crammed the script into my backpack and left. Why was Mrs. Lahti pressuring me to audition for a play when she knew I’d make a fool of myself? Besides, I had my own agenda—I planned to run for our junior high student council next month when our school held its annual elections. To me, that was a much more constructive use of my energy than memorizing meaningless lines for a play.

For the next week, I rehearsed the various highlighted scenes for the tryouts and practiced some of the simple stage directions. For instance, in Act I, Tom is supposed to be whitewashing a fence with a paintbrush. Grabbing some socks for my prop, I practiced that simple gesture in front of a mirror in the privacy of my bedroom, but I felt as awkward and stiff as a robot. By the end of the week, I concluded that Mrs. Lahti was expecting miracles from me. I had to tell her I was quitting.

A Drama, continued

When I walked into Mrs. Lahti’s room early on Friday morning, my appearance did not surprise her. Without a pause, she pushed the papers she was grading to the side, giving me her full attention.

“I don’t want to be in the Drama Club,” I blurted, getting straight to the point. “I’m awful at performing on a stage, and I’ll ruin your play. Besides, I want to work on my campaign for student council.”

“Before you make any decisions,” Mrs. Lahti replied diplomatically, “let me tell you my story.”

“Okay,” I mumbled in agreement, but as I plopped down at the desk in front of her, I didn’t think anything she said could change my mind.

“Believe it or not,” Mrs. Lahti began, “when I was in junior high, my grandfather challenged me to audition for our school play, and my reaction was about the same as yours—I could never do it. Whenever I tried to give a speech, I turned into a frozen block of ice. I had trouble speaking comfortably with new acquaintances, too. My grandfather knew I had my heart set on being a teacher one day, and I would have to overcome my extreme shyness to succeed. He told me that being in a play would help me conquer my speaking fears, and it was the best suggestion anyone ever gave me. I got a small part in our school play—I was no star—but I slowly began to gain some confidence.”

“I . . . I don’t want to be a teacher,” I responded defensively.

“But Mario, I know you’re passionate about being a congressman one day,” Mrs. Lahti countered, “and public speaking will be a vital skill in that profession. I believe you’d be a fantastic leader, and I don’t want to see any hurdle blocking your way—please think about it.”

As I left Mrs. Lahti’s classroom and wandered toward my locker, her story and her compliment kept ringing in my ears. I was pretty happy that Mrs. Lahti had battled her fears and become a teacher; she had a way of making students feel like they could accomplish anything—but could I really perform for an audience?

On the day of the auditions, I joined the students congregating outside the library, waiting for their chance. When Mrs. Lahti eventually summoned me, I resolutely followed her inside. My mouth felt as if I’d stuffed it full of cotton balls, and I sputtered through the first scene. When I turned the page, I dropped the script, and then I stumbled over my feet when I stooped to grab it. Instantly, my face flushed like a ripe red tomato, and I longed to vanish into the air. However, I closed my eyes, took a deep, steadying breath, and forced my squeaky voice to recite the next line.

Mrs. Lahti nodded in approval, and I stood a few inches taller as I continued on with the scene. At that moment, my own story began to unfold, and, best of all, I realized I possessed the power to shape its plot.

SECTION D

Modified Tuning Protocol



Invasive Species

Upon arrival in Hilo, Hawaii, the first thing visitors notice—besides the lush green landscape and ebony volcanic rock—is the sound of frogs. Visitors might find the sound charming, but residents feel otherwise. “Just imagine having to listen to that all the time,” one resident remarked. “And then you wouldn’t think it was so great either!”

The coqui frogs are responsible for the repetitive *ko-kee* chirps in Hilo, and the reason why their sound is so overwhelming is that they themselves are overwhelming. These little coin-sized amphibians are not native to the Hawaiian Islands; they hail from Puerto Rico and supposedly arrived in potted plants decades ago. Due to a lack of natural predators in this part of the world, they multiplied rapidly, threatening the native amphibian population and wreaking havoc on Hilo’s entire native food chain. After all, when there’s an abundance of one member of a food chain, all other members are adversely affected due to the imbalance. In some parts of the island, the frog’s population has exploded to more than 10,000 frogs per acre.

Another fact of note is that the population of the coqui frogs in Hilo is estimated to be about three times larger than in Puerto Rico. That’s because the coqui has natural predators in Puerto Rico that keeps its population at bay.

The coqui frog is the perfect example of an invasive species. According to the scientific definition, an invasive species is an organism that is non-native to an environment and causes harm to the economy, environment, or human health of the area. The coqui frog, of course, is just one example of thousands (or tens of thousands) of invasive species throughout the world.

There are numerous examples of invasive species in Nebraska. One example is the tumbleweed, which was introduced to the western United States back in the late 1800s and became a growing problem throughout the region. The seeds of this plant hitchhiked inside a bag of wheat that Russian settlers most likely brought into South Dakota.

Another invasive species wreaking havoc in Nebraska is the zebra mussel. This mollusk is endemic to the Caspian Sea area of Asia and also likely hitchhiked to the United States. Experts believe that it came inside ballast waters of large commercial vessels from Europe. These mollusks decimate local mollusk populations and multiply rapidly. They build up everywhere water is present—even inside the pipes at power and water treatment plants. These obstructions cause millions of dollars’ worth of damage.

While it may be impossible to completely rid an area of an invasive species, you can help prevent their spread.

First, do not transport plants (potted plants, seeds, fruits, and vegetables) and animals from one part of the world to another. The reason is to prevent the spread of all kinds of invasive species, including the plants themselves and any microorganisms living on the plant or in the soil. Unlike most frogs that lay their eggs in water, the coqui frog lays its eggs on plants, which is how the frog spread from Puerto Rico to Hawaii. People who bring in animals from one part of the world can also cause problems with invasive species, especially if those animals get released into the wild. Burmese pythons were brought in to Florida as pets. Then people decided they didn’t want to

SCIENCE

Invasive Species, continued

have them as pets anymore, so they released them into the Everglades. Now, this snake competes for resources of native reptile species and is damaging the fragile ecosystem of the Everglades.

Second, make sure you don't transport water from one place to another. For example, if you like to go boating, make sure your boat doesn't have any trapped water inside when you go back home. Also, wipe down the boat completely before leaving the site—the inside and outside of the boat plus underneath. Also wipe down the trailer if it came in contact with the water at all.

Third, make sure you don't track seeds and other "hitchhikers" on your shoes from one place to another. Clean the soles of your shoes before you leave your hiking or camping spot.

Fourth, do not transport firewood from one place to another. If you're camping, use the wood from that area; don't bring any in from home. Invasive insects lay their eggs in wood and if brought to a new area, they can decimate an entire forest in no time.

The best piece of advice that experts have for concerned citizens is to become educated on invasive species. Understand that one action by one individual can have outreaching effects on an entire ecosystem. This isn't just an environmental issue, though. The United States alone spends billions of dollars every year to combat the spread of invasive species.

All of us should do our part to prevent the spread of these alien invaders. After all, it might sound cool to feel like you're sleeping on a lily pad, but if you wake up to find that frogs have taken over your entire neighborhood, you would probably not find it enjoyable at all.

Online Algorithms

A day in the life of an online user

Deion starts off his day checking his social media feed. He likes a bunch of one of his friend's posts. He even clicks on an article his friend shared about recycling—a topic they must research for a group project. He reads it and clicks on a few links that the article suggests. He'll talk to his group later about what he learned to see if the other members want to include it in the project. As he eats breakfast, he clicks on his favorite band from a music streaming app and listens to the music reverberating through his earbuds. After school, Deion spends more time liking posts on social media and sharing some of his own content. He then looks through a video streaming service to pick out a few movies to watch. After dinner, Deion reads up a little more on recycling before heading off to bed. Deion follows similar online activities for the next several days.

It's necessary to know all of Deion's online activities to understand what happens when he goes online later in the week. When Deion gets on social media, most of the posts in his feed now belong to the friends whose posts he had liked earlier. He doesn't automatically see posts from people who had previously populated his feed. He also notices ads popping up in his web browser for recycling and his favorite band. In his music stream, he doesn't see as many options as he once had. Now, he mainly sees either his favorite band's music or bands that play similar music. Similarly, in the video streaming app, he doesn't see as many varieties of entertainment. His feed mostly displays videos that relate to what he previously viewed.

Deion feels a little frustrated. Sure, it's cool to have things that he's interested in more easily at his fingertips. But these are not his only interests. He likes many other topics too, not just the ones that he's

previously searched for or viewed. He wants to see *all* his friends' posts, not just a few. In addition, once this social studies project is over, he really doesn't want recycling ads to pepper his social media feed.

A tailored experience

As you can probably attest, Deion's experience is not unique. This happens often, if not all the time, on the internet. That's because search engines, websites, social media platforms, music and video streaming services, and other apps all use mathematical formulas called "algorithms" to tailor your online experience just for you. Their goal is to display the things you're most interested in, so you'll keep coming back for more. While this feature can be helpful at times, it can certainly be irritating at others. Most people are like Deion. They want to choose for themselves what they get to see and not have their past activities dictate their present and future.

How algorithms work

An algorithm is a step-by-step procedure that is meant to tell how to complete a certain task or achieve a certain outcome. Algorithms have a clear beginning and end. Mathematicians have used them for thousands of years. For example, when you learned how to do long division, you were taught how to use an algorithm: you followed steps in a specific order to obtain the correct answer. When you follow a recipe to make cookies, you are also following an algorithm.

Computer algorithms are written in natural languages first and then translated into code. These codes tell computers to do a certain job. Computer programmers are responsible for creating these algorithms.

Keep reading >>

Online Algorithms, continued

How algorithms work, continued?

In Deion's case, the programmer might have created the algorithm to say, "Find ads that relate to the user's clicks," or "Show posts only for accounts that the user has recently liked," or "Show videos only that have the same subject categorization as the user's recent views."

In the online world, data is gathered about your online activities all the time. The internet stores this data and then uses it to tailor the individual user's experience. Along with your online activity data being stored, your location data is also stored. If you carry a smartphone with you and allow it to track your location, then your online experience will also be affected. You may end up with ads for restaurants in the areas where you have recently visited or suggestions for things to do in a certain town or city.

Pros and cons of algorithms

As with everything, algorithms certainly have their pluses and minuses. They are a terrific way to utilize the power of mathematics in a modern world because they can help make our lives more efficient. The internet gets to know you and, through the use of algorithms, can tailor what you see to your specific preferences.

Naysayers feel that algorithms can have a negative effect on individuals and society. There is a growing concern that algorithms tailor experiences so specifically that they affect people's ability to obtain necessary information.

For example, people searching for information about a candidate in an upcoming election may retrieve different hits depending on their previous activity in the search engine or social media platform. One person, whose views coincide with those of the candidate, may see

only favorable reviews of the candidate, at least on the first page or two of hits. By contrast, a person who opposes much of what the candidate espouses may see only negative reviews of the candidate. The risk is that neither person will obtain a complete, unbiased picture of the candidate without actively seeking out objective sources.

While algorithms may be helpful, they are also heavily biased toward showing only things that users will like, agree with, or support. Because of that, they thereby limit the critical thinking and conversations that need to happen to understand opposing positions and points of view.

Future of algorithms

There's little doubt that algorithms in the online world are here to stay. However, we need to have more of a conversation about their role in our lives. How much should they dictate what we see and experience online? How can users have more of a say in how the algorithms work on their behalf? All these questions and more will certainly need to be answered to improve the online experiences for all users.

Give Me Liberty or Give Me Death

In 1775, Patrick Henry, one of the Founding Fathers, delivered an impassioned speech encouraging a fight against British rule.

Give Me Liberty or Give Me Death Patrick Henry

Patrick Henry, March 23, 1775.

No man thinks more highly than I do of the patriotism, as well as abilities, of the very worthy gentlemen who have just addressed the House. But different men often see the same subject in different lights; and, therefore, I hope it will not be thought disrespectful to those gentlemen if, entertaining as I do opinions of a character very opposite to theirs, I shall speak forth my sentiments freely and without reserve. This is no time for ceremony. The question before the House is one of awful moment to this country. For my own part, I consider it as nothing less than a question of freedom or slavery; and in proportion to the magnitude of the subject ought to be the freedom of the debate. It is only in this way that we can hope to arrive at truth, and fulfill the great responsibility which we hold to God and our country. Should I keep back my opinions at such a time, through fear of giving offense, I should consider myself as guilty of treason towards my country, and of an act of disloyalty toward the Majesty of Heaven, which I revere above all earthly kings.

Mr. President, it is natural to man to indulge in the illusions of hope. We are apt to shut our eyes against a painful truth, and listen to the song of that siren till she transforms us into beasts. Is this the part of wise men, engaged in a great and arduous struggle for liberty? Are we disposed to be of the number of those who, having eyes, see not,

and having ears, hear not, the things which so nearly concern their temporal salvation? For my part, whatever anguish of spirit it may cost, I am willing to know the whole truth; to know the worst, and to provide for it.

I have but one lamp by which my feet are guided, and that is the lamp of experience. I know of no way of judging of the future but by the past. And judging by the past, I wish to know what there has been in the conduct of the British ministry for the last ten years to justify those hopes with which gentlemen have been pleased to solace themselves and the House. Is it that insidious smile with which our petition has been lately received? Trust it not, sir; it will prove a snare to your feet. Suffer not yourselves to be betrayed with a kiss. Ask yourselves how this gracious reception of our petition comports with those warlike preparations which cover our waters and darken our land. Are fleets and armies necessary to a work of love and reconciliation? Have we shown ourselves so unwilling to be reconciled that force must be called in to win back our love? Let us not deceive ourselves, sir. These are the implements of war and subjugation; the last arguments to which kings resort. I ask gentlemen, sir, what means this martial array, if its purpose be not to force us to submission? Can gentlemen assign any other possible motive for it? Has Great Britain any enemy, in this

Keep reading >>

Give Me Liberty or Give Me Death, continued

quarter of the world, to call for all this accumulation of navies and armies? No, sir, she has none. They are meant for us: they can be meant for no other. They are sent over to bind and rivet upon us those chains which the British ministry have been so long forging. And what have we to oppose to them? Shall we try argument? Sir, we have been trying that for the last ten years. Have we anything new to offer upon the subject? Nothing. We have held the subject up in every light of which it is capable; but it has been all in vain. Shall we resort to entreaty and humble supplication? What terms shall we find which have not been already exhausted? Let us not, I beseech you, sir, deceive ourselves longer. Sir, we have done everything that could be done to avert the storm which is now coming on. We have petitioned; we have remonstrated; we have supplicated; we have prostrated ourselves before the throne, and have implored its interposition to arrest the tyrannical hands of the ministry and Parliament. Our petitions have been slighted; our remonstrances have produced additional violence and insult; our supplications have been disregarded; and we have been spurned, with contempt, from the foot of the throne! In vain, after these things, may we indulge the fond hope of peace and reconciliation. There is no longer any room for hope. If we wish to be free—if we mean to preserve inviolate those inestimable privileges for which we have been so long contending—if we mean not basely to abandon the noble struggle in which we have been so long engaged, and which we have pledged ourselves never to abandon until the glorious object of our contest shall be obtained—we must fight! I repeat it, sir, we must fight! An appeal to arms and to the God of hosts is all that is left us!

They tell us, sir, that we are weak; unable to cope with so formidable an adversary. But when shall we be stronger? Will it be the next week, or the next year? Will it be when we are totally disarmed, and when

a British guard shall be stationed in every house? Shall we gather strength by irresolution and inaction? Shall we acquire the means of effectual resistance by lying supinely on our backs and hugging the delusive phantom of hope, until our enemies shall have bound us hand and foot? Sir, we are not weak if we make a proper use of those means which the God of nature hath placed in our power. The millions of people, armed in the holy cause of liberty, and in such a country as that which we possess, are invincible by any force which our enemy can send against us. Besides, sir, we shall not fight our battles alone. There is a just God who presides over the destinies of nations, and who will raise up friends to fight our battles for us. The battle, sir, is not to the strong alone; it is to the vigilant, the active, the brave. Besides, sir, we have no election. If we were base enough to desire it, it is now too late to retire from the contest. There is no retreat but in submission and slavery! Our chains are forged! Their clanking may be heard on the plains of Boston! The war is inevitable—and let it come! I repeat it, sir, let it come.

It is in vain, sir, to extenuate the matter. Gentlemen may cry, Peace, Peace—but there is no peace. The war is actually begun! The next gale that sweeps from the north will bring to our ears the clash of resounding arms! Our brethren are already in the field! Why stand we here idle? What is it that gentlemen wish? What would they have? Is life so dear, or peace so sweet, as to be purchased at the price of chains and slavery? Forbid it, Almighty God! I know not what course others may take; but as for me, give me liberty or give me death!

Henry, Patrick. "Give Me Liberty or Give Me Death." *Britannica Online Encyclopedia* and the Project Gutenberg Consortia Center.

The Ancient Singer

When Dawson dropped his sheet music at the end of band class, one page glided beneath a mysterious, bundled object in the corner of the room. Since the school day was over, he had time to investigate. He uncovered it and found an instrument with two rows of wooden keys.

“Ah, I see you’ve discovered our marimba,” Ms. Lee, the junior high band teacher, remarked as she handed Dawson the rest of his scattered pages.

“Let me demonstrate its sound for you,” Ms. Lee offered, rummaging through a nearby cabinet. She took out a set of mallets and rhythmically danced them across the keys.

Like magic, the wooden bars jumped to life, singing with a deep rich timbre that seemed to vibrate through Dawson; the unique tones enthralled him.

“I want to learn how to play the marimba,” Dawson announced impulsively. He was the lead musician in the band’s percussion section, and he could already play the drums, xylophone, and bells.

“The marimba can be a difficult instrument to master,” Ms. Lee hesitantly responded. “The most experienced players hold two or three mallets in each hand and strike multiple keys at the same time. For the past few years, our small band hasn’t had any students willing to devote the necessary time.”

“I’ll stay after school for lessons,” proposed Dawson, undeterred, “and I promise to spend enough time practicing, too.”

“Okay—it’s a deal,” Ms. Lee agreed, her expression brightening. “I’m going to see if I can find a composition for our band that includes a solo marimba part,” she proclaimed.

After school the next day, Dawson’s friend Ariana hollered to him and dashed down the hallway in his direction as he slammed his locker shut.

“Do you want to come mountain biking on the Maple Forest Trail with Jackson and me?” Ariana invited.

“I have a music lesson with Ms. Lee—she’s going to teach me how to play the marimba,” Dawson explained as Jackson meandered over to join them.

Immediately, Jackson’s forehead wrinkled in confusion as he asked, “The what?”

“The marimba—it’s an instrument with wooden keys that kind of resembles the xylophone,” Dawson described.

“I wouldn’t want to start over again learning to play a new instrument,” Ariana commented. “That would take *months* of practicing, and I can finally play my clarinet without squeaking.”

“Yeah,” Jackson chimed in, “you’re an expert drummer, but you’ll be a rookie on the marimba.”

“I’m going to try anyhow,” Dawson replied resolutely. Then he turned and marched down the hallway toward the band room.

The Ancient Singer, continued

During the next two weeks, Dawson often recalled his conversation with Ariana and Jackson as he struggled through his first lessons. Simply keeping his eyes on the sheet music propped on its stand was impossible when he had to constantly move along the lengthy keyboard. Holding the mallets felt awkward, too, and he grappled to learn the basic technique with one set. *How would he ever manage two—or three?*

“Try this—think about how you wave goodbye to someone. Move your hands that way, which will cause your wrists to flex,” Ms. Lee suggested one Friday, “and let the mallets rebound after you strike the keys. The upward motion draws the sound out.”

Dawson sighed heavily, briefly wondering what Ariana and Jackson might be doing. Gradually, he coaxed a tentative scale from the rosewood keys.

“You’re improving,” Ms. Lee encouraged, “and I’m pleased with your progress.”

“But . . . at this rate, it’s going to take me a century to learn ‘Twinkle, Twinkle, Little Star,’” Dawson grumbled with flagging spirits.

Ms. Lee eyed Dawson’s slumped shoulders. A moment later, she strode across the room and extracted a book from her shelf titled *The Marimba, an Ancient Singer*.

“The marimba is an old friend that will repay your loyalty,” Ms. Lee smiled as she placed the book in Dawson’s hands. “The Zulu people have a story about a goddess named Marimba who they say created this instrument by hanging hollow gourds beneath some wooden bars. In reality, people in Africa did use hollowed-out gourds to

construct some of the first marimbas, and they carved wooden keys to position above them. Not only that, the people individually tuned each gourd to match the primary pitch of its corresponding key. Eventually, workers from Africa brought the marimba to Central America, and over time people started replacing the gourds with wooden tubes.”

“But our marimba has metal tubes,” Dawson noticed, “that make the resonating sound.”

“Designers began producing marimbas with metal tubes in the 1900s,” Ms. Lee continued, “and adapted the marimba for performing in bands and orchestras. You’re welcome to take this book home and read more, but most of all, I’d like you to go to the library and find a CD featuring marimba music to listen to.”

Dawson left the band room and half-heartedly wandered up the steps to the school library. Logging in to a computer, he checked the library’s catalog and jotted down the call number for several CDs that featured marimbas. Ten minutes later, he was on his way home with several discs tucked in his backpack.

That evening, Dawson borrowed his mom’s old CD player and retreated to his bedroom. He slipped the first disc into the machine, turned up the volume, and collapsed on his bed. All at once, the music flooded the room with joyful, bell-like tones, bouncing like sunbeams all around him, and a wide smile began a slow spread across his face. He continued to listen, feeling awed at the innovative range of sounds; there was even a bluesy jazz melody that washed over him like a wave of loneliness. Dawson had always loved the way music could connect a person to emotions, and the marimba had its own distinctive voice and power. He was determined to tap into those rich possibilities.

Keep reading >>

The Ancient Singer, continued

For the next two weeks, Dawson doubled the length of his practice sessions. Finally, one afternoon during band practice, Ms. Lee invited Dawson to play a small marimba solo during their final song. When the selection ended, the band members spontaneously clapped.

“That was impressive,” Ariana complimented Dawson after class, praising his hard-earned ability.

“Now you can finally take a break from all that practicing,” Jackson suggested. “Ariana and I are planning to train for a triathlon next summer. We’re going to start by taking some swimming lessons.”

“I don’t have time for that yet,” Dawson swiftly responded. “I still need to learn how to play the marimba with two sets of mallets before our concert in June.”

“Suit yourself,” Jackson replied with a disappointed sigh, but he did not dissuade Dawson.

As the intervening months swept by, Dawson strictly followed his practice regimen, dedicated to honing his skills. On the evening of the concert performance, his marimba solo earned him a standing ovation. Yet the reward Dawson received the following day was the one he valued most. When he walked into the band room, Ms. Lee eagerly handed him a paper with a name and phone number.

“Who is Mr. Arnold Cohan?” asked Dawson, staring at the name with a bewildered look.

“He’s the director of the community orchestra,” Ms. Lee announced, and her eyes glinted with approval. “He heard your performance at the concert last night, and he’d like you to practice and perform with the community orchestra this summer. Because the marimba is such an unusual instrument, they don’t have anyone who can play it. It’s an exciting opportunity for you; I’ve heard they’ve been invited to perform at our state capitol!”

“Wow! That would be so amazing!” Dawson gulped, and his heart skittered. The marimba had demanded his full attention, but now his old friend was leading him straight toward some unexpected opportunities.

SECTION E

**Learning Center 1:
Writing Quality Prompts**



With Captain Cook

This story is based on a real event that occurred in 1769. Captain James Cook and his crew left England in August 1768 on the ship Endeavour and arrived in Tahiti in April 1769. The islands of Tahiti were chosen because of their ideal location to see the transit of Venus across the sun. The journey took eight months, and the crew had no way to be in contact with anyone back home.

I was so relieved to wake up to a cloudless sky today. Captain Cook has been concerned about the weather on this particular day for weeks. There's not much that we could do if the weather was cloudy, but it certainly would have been an enormous disappointment if we hadn't had a clear view of the golden sun in the sky. We would have traveled all that distance from England for nothing—thousands and thousands of miles! Today wasn't just any day; today was the long-awaited day of the transit of Venus.

We spent months building the fort where we planned to set up our observatory. We set it up like a military fort, with earthworks around three sides and palisades crowning the top like the jagged teeth of a dragon. Every day was work from sunup to sundown. After spending eight long months at sea, the crew had hoped for a little relaxation when we arrived in the islands. Instead, Captain Cook put us to work within two days of our arrival.

In hindsight, beginning work right away on the fort was best, because we finished it just in time. We have the telescopes set up right now, and all that's left to do is to wait for the big moment when Venus will make its journey across the sun!

My heart sank when Henry, one of my shipmates, let me know that he and I were on guard duty for the rest of the day. I'm not sure what we're guarding, because the locals here are kind and have yet to show an objection to our presence. If we're on guard duty, that means we won't be anywhere near the telescopes to see the transit when it happens. All these months, all this work, and for nothing.

I'm on a dinner break right now, and I must write more about how the day went. Henry and I were busy guarding the fort, as we had been ordered. Then one of the men came running over yelling, "Come quick, the captain wants you!" Henry and I immediately abandoned our posts and darted after our fellow sailor.

"Captain, did you send for us?" I asked when we reached the men standing near the telescopes.

"Yes, I did," Captain Cook responded quickly. "It isn't right that any of our men should miss the opportunity to see the transit of Venus, particularly after all we've been through together to get to this very day. No need to guard your post, men. Stay here with us and prepare to watch history in action."

"Thank you, sir" was all I could think of to say in reply.

The transit of Venus was as astonishing as I had imagined. We peered through the telescopes and watched a little black disc move across the golden yellow sun in a perfect arch. What I saw was life-changing.

With Captain Cook, continued

Captain Cook hopes to use this information to prove the size of our solar system. I'm not exactly sure how he intends to do this, but I don't really need to know, now do I? What's important is that I was here for this momentous occasion. After all, this happens only every 120 years or so—at least that's what Captain says. I cannot wait to share my journal with my family when I get home. They will not believe the wonders I have seen!

SCIENCE

Émilie du Châtelet

In recent decades, we've seen the creation of several policies and programs to encourage more girls and women to build careers in science, technology, engineering, and math (STEM). One might assume that before the 20th century, no outstanding scientists, mathematicians, or engineers were women. In fact, a few women, like Émilie du Châtelet (née de Breteuil), beat the odds stacked against them in society to achieve remarkable success.

Du Châtelet was born on December 17, 1706, in Paris, France. Du Châtelet's father was a member of the French court of Louis XIV. During that time, it was popular for aristocratic families like du Châtelet's to invite famous philosophers, scientists, writers, and artists to their homes for intellectual and clever discussions about science, politics, art, and culture. These discussions, called "salons," were sometimes held in meeting places where women were excluded. However, du Châtelet's family allowed her to attend the salons held in her home. Meeting the intellectuals of the time, du Châtelet became very interested in many different fields of study.

As an aristocrat, she had a reasonably good education, and she had a curious and quick mind. She spoke six languages by the time she was 12. Her parents also permitted her to learn sports such as fencing and horseback riding. Du Châtelet was most fascinated, however, by her early exposure to math and science (which was called "natural philosophy" at the time), and she excelled at these subjects. Although her mother thought these studies were inappropriate for a young lady of the time, her father appreciated du Châtelet's intelligence and hired tutors to teach her astronomy and physics.

Like all ladies of the time, du Châtelet was expected to get married. She had many suitors and at age 18 married the Marquis Florent-Claude du Châtelet-Lomont, a high-ranking army officer. Upon her marriage, she gained a new title and became known as Marquise Émilie du Châtelet. Her husband understood that scientific studies were important to her, and his frequent, long absences as he travelled with the army allowed her to pursue her own interests.

While she could not go to university to pursue her passion for scholarship, she invited prominent scholars of the day to her home. She became the student, and sometimes the friend, of some of the most significant scholars in Europe at the time. Her mathematical abilities and scientific thinking skills made her an equal (at least) to the intellectuals of the time.

Du Châtelet was not satisfied being a student or friend of brilliant men. She had her own brilliance, and she was not shy about using it. Her position in society also allowed her to do things other women could not. As a form of protest against the "no women allowed rule" at Parisian cafés, she dressed as a man to enter one establishment where mathematicians, astronomers, and physical scientists met to discuss their interests.

Du Châtelet worked many hours a day, studying, conducting experiments, and writing to contribute new mathematical and scientific ideas. She authored and co-authored books on physics and math. In 1737, after months of doing experiments in secret, she used a man's name to submit one of her papers, on the physics of fire, to a contest. Her paper didn't win, but it was well received and circulated in the scientific community.

Keep reading >>

SCIENCE

Émilie du Châtelet, continued

In the 18th century, several new, competing ideas about earth, space, biology, and how it all worked (physics) arose. In one book, *Institutions de Physique*, du Châtelet attempted to integrate the most prominent theories of the day, those of René Descartes, Isaac Newton, and Gottfried Leibniz. She also wrote other, more philosophical books on the themes of free will; the nature of space, matter, and force; and the nature of happiness.

In addition to authoring or co-authoring papers and books, du Châtelet spread others' ideas through her painstaking translation work, which required comprehension of highly complex, technical ideas in other languages. One of her greatest contributions to science was the translation of Sir Isaac Newton's major work *Principia (Mathematical Principles of Natural Philosophy)* into French. Newton's theories were not well known outside of England, and du Châtelet's translation allowed his ideas to spread much more widely. What's more, du Châtelet's notes in the translations interpreted, improved on, and clarified Newton's writing so that the work was more accurate and comprehensible. She also conducted experiments and published results on them that confirmed some of Newton's theories of physics.

Any one of these accomplishments is significant. The fact that Émile du Châtelet read, studied, wrote, published, and gained recognition in a male-dominated world requires us, in the 21st century, to ask how much more we will learn and how many STEM advancements we will make as girls and women are encouraged to flourish in these fields.

The Strait of Gibraltar

Entrance to the Mediterranean

The Strait of Gibraltar is located at the border between the Mediterranean Sea and the Atlantic Ocean. A strait (also called “a channel,” “an inlet,” or “an isthmus”) is a narrow passage of water that connects two larger bodies of water. At the narrowest point, the Strait of Gibraltar is only nine miles wide.

On one side of the Strait of Gibraltar sits North Africa, specifically Morocco. On the other side sits Europe, specifically the Iberian Peninsula, where Spain is located. The most famous spot along the strait is the British territory of Gibraltar. This is where the Rock of Gibraltar is located.

Historical significance

The Rock of Gibraltar (or “the Rock”) is a rocky peninsula that is the most important landform in the straits. During classical times, the Rock of Gibraltar and a matching rock on the African side were known as the Pillars of Hercules. Numerous legends were told about this mythical passageway, including that it was the entrance into the great city of Atlantis that had disappeared into the ocean.

The Rock has held historical significance for thousands of years, due mainly to its strategic location. Any ship trying to get into and out of the Mediterranean had to pass right by this landform. Therefore, whoever controlled the Rock, especially during wartime, essentially controlled the water access into the entire Mediterranean region. The Rock has changed hands many times over the centuries with numerous countries controlling it. Since the 1700s, the British have controlled it.

The Rock is heavily fortified with manmade tunnels in the mountainside. These tunnels allow people to move about without being detected from the outside, which was particularly valuable during World War II. The British were able to maintain control of the Rock throughout the length of the war, even though many battles were fought there. The war may have turned out very differently had the British not been able to hold on to this position.

Today, the Rock continues to be a passageway of great importance. Hundreds of ships pass through the Strait of Gibraltar every day as both travelers and goods flow in and out of the Mediterranean.

Tectonic activity creates and destroys

The Strait of Gibraltar was initially formed millions of years ago when the Eurasian and African tectonic plates pushed away from each other. Now, as the African plate moves northward and converges under the Eurasian plate, the strait is closing at a very slow rate.

Millions of years from now when the strait is sealed tight, there will no longer be an entrance into the Mediterranean from the Atlantic Ocean. When that happens, the Mediterranean will turn into a dead sea. A dead sea has water much saltier than an ocean and has no outlets. In the case of the Mediterranean, the only outlet from this sea is at the Strait of Gibraltar.

The Strait of Gibraltar, continued

Movement of currents

The currents in the Strait of Gibraltar move in two main directions: east and west. The water from the Mediterranean moves westward toward the Atlantic Ocean, and the water from the Atlantic Ocean moves eastward into the Mediterranean.

The makeup of the water of the two seas is distinctly different from each other. After all, not all salt water is made the same. The water in the Mediterranean is warmer and saltier. Because of the higher concentration of salt, the denser water flows deeper in the strait. The water from the Atlantic is cooler and less salty, so it flows above the Mediterranean current.

Understanding these currents is imperative for ship captains so they can safely navigate these waters. The waters can be turbulent where the two seas converge.

Barbary macaques

One of the oldest inhabitants on the Rock is the Barbary macaque. This is the only primate that still lives on the continent of Europe. The Barbary macaques are monkeys, and very aggressive ones at that. They have become accustomed to people and know what kinds of objects

contain food (such as backpacks) and will walk right up and snatch things from people! They will hop on the back of a tourist and either unzip a backpack or wrench it right off the person's back. Tourists beware of these furry, seemingly innocent-looking creatures.

Legend has it that as long as the Barbary macaques live on the Rock, the British will remain in possession of the island. Even though it is just folklore, the British brought Barbary macaques in from Africa during World War II just to make sure there were enough on the island to maintain a sizable population.

Visiting the Strait

Many people visit this part of the world every year. They take ferries back and forth between Africa and Europe. Some even just hop between the two continents on day trips. For travelers and for the global economy, the Strait of Gibraltar maintains a role of great significance.

Searching for Math in Architecture

The hidden component

Look at the human-built structures all around you: the houses, apartment buildings, office complexes, roads, bridges, school buildings, skyscrapers, and stadiums. Every single one of these objects is an example of architecture, and each of them involved mathematics in their construction.

Math and architecture go back as far as buildings themselves. Even when people did not realize they were using math in their construction projects, they were still using math. Math is hidden in the background of all structures. It's in the angles, shapes, lengths, widths, and weights of materials. It's also in the design, the way the pieces fit together into a cohesive whole. All parts of construction involve math.

Mathematical failures

Examples of structures that fail also demonstrate mathematical principles. Let's say that you want to build a shed in your backyard. You don't want to follow any plans; you simply want to build and innovate as you go along. This process might work out, but then again, it might not. You may end up with a building whose roof caves in and walls collapse after the first snowfall or heavy storm. That failure would result from the fact that you didn't figure out the correct angles for the pitch of the structure. Or you might end up with a shed that is so skewed in its shape that you can't close the door all the way.

Why do some structures fail? One reason, as we just learned, concerns the types of angles involved in construction. Instead of constructing perfectly pitched angles for the roof, builders may use less desirable

angles that make the roof too flat and faulty in snowy weather. Instead of using right angles in the sides of the structures and making sure the walls are plumb, builders may construct obtuse or acute angles. The resulting slanted walls don't allow doors or pictures to hang straight.

Necessities of basic principles

Preventing buildings from failing is why architects and construction professionals must have a clear understanding of mathematics and consistently use that knowledge in their trades. By understanding the importance of angles, lengths, widths, and weights, they can construct buildings that are not only functional, safe, and reliable, but also beautiful and pleasing to the eye. Architects and construction professionals employ a variety of mathematics in their profession, including algebra, geometry, trigonometry, and calculus.

Ancient and classical principles

One of the most basic mathematical principles used in architecture since ancient and classical times is the golden ratio. The reason: the golden ratio makes things more eye-appealing. The golden ratio follows a principle found in nature in which a large rectangle is continuously divided into smaller and smaller rectangles following a specific pattern—the length of each rectangle is divided by the same rectangle's width to equal 1.618, or Phi.

The golden ratio is famously present in such structures as the pyramids of ancient Egypt, the Parthenon in Athens, the Notre Dame in Paris, and the Taj Mahal in India. It is also found in modern structures.

Keep reading >>

MATH

Searching for Math in Architecture, continued

Shapes, shapes, shapes

Geometry plays a significant role in architecture, especially because geometry is the branch of mathematics that involves 2-D and 3-D shapes, angles, lines, solids, and flat and round surfaces.

Not only are the outsides of buildings a collection of shapes—look at the rectangles, circles, pentagons, squares, triangles, hexagons, and octagons in the structures all around you—but the shapes are also found within the interior design. One key way that shapes are used in architecture is in tessellations: murals, tiling patterns, and so forth. A tessellation is a pattern of repeating shapes that fit together. Picture the backsplash in a kitchen or the tiling pattern on a bath-room floor. Even basic rectangle and square tiles can be examples of tessellations.

Math all around us

Simply put, math is all around us. It's in nature. It's in architecture. It's in computers, smartphones, cars, planes, and all our household appliances.

What other ways can you think of that math can be used? Maybe you will be the one to come up with the next greatest world-changing invention by applying those principles you've been perfecting in math class.

SECTION F

Learning Center 3:
Choosing Quality Texts



TEXT 1

Your Guide to Cell Phone Plans

Plan options

You have a lot to think about when choosing a mobile phone plan. Voice, data, speed, and coverage all vary based on provider. Each provider also bundles its plans differently. In addition, people use their phones in different ways. Some people use their phone for nearly all their communication, social networking, games, navigation, research, calendars, contacts, and even school work. Others just want good telephone and text service with a decent camera. For some people, an individual plan provides what they need; others prefer less commitment and choose to pay month to month. Many families find that family plans give them the biggest bang for their buck.

Cell phone plan providers (sometimes called “carriers”) do not make it easy for consumers to compare. Some plans are available only with certain phones, some are available only in certain geographic areas, and some are available only to new customers. In addition, the providers are market savvy and tend not to give away too much of what consumers want in one plan. For example, if they provide a lot of data for a low price, they likely make up for that benefit by not including another premium feature, such as high speed.

We analyzed dozens of cell phone family plans and have summarized the details on the most common and important features. Use the comparisons of our top-rated plans to choose the best one for your needs.

Based on data that the consumer research network collected, the features most families want in a plan include:

- unlimited calls and texts in the United States
- data plan of at least 1 GB of data per phone per month
- inclusion of at least four phones in the plan
- consistently fast speed
- budget-friendly pricing

Explanation of features

“Talk” refers to voice data. This is how traditional voice-to-voice phone calls travel through the network. Limited talk means that the plan allows only a certain number of minutes per billing term before the provider charges extra money or simply turns off the voice service. Unlimited talk means that consumers may make as many phone calls for as many minutes desired in a billing period, with no extra charge.

“Text” refers to the ability to send text messages. A limited text plan includes only a certain number of texts or megabytes of text data per billing period before the provider cuts off the delivery of texts. An unlimited text plan means that consumers may send and receive as many texts and megabytes of text data as they want in a billing period.

“Coverage area” refers to the geographic area in which the plan is functional. Not all plans include coverage across the entire country. A provider might limit a plan to the consumer’s region (such as one state or a three- to five-state region), with additional charges applied

Keep reading >>

TEXT 1

Your Guide to Cell Phone Plans, continued

Explanation of features, continued

as soon as the consumer travels outside that region. A nationwide plan means that the features are available across all 48 contiguous US states. By contrast, carriers provide nationwide service in all 50 states. Consumers should carefully examine coverage area, because some carriers offer talk on one network and text and data on another—meaning that they may allow nationwide talk but not nationwide text or data, or vice versa.

“Speed” refers to the swiftness and reliability with which data is sent through the network. Think about how quickly you can text back and forth with your friends or how fast your navigation app or social networking sites load. The network speed determines this rate. An important caveat about speed advertised by carriers is that they list the maximum speed their network is capable of in *ideal* conditions. Factors such as location, phone capabilities, and expense of plan chosen can affect what speed any user of the network experiences.

“Data” refers to the information sent across the network that is neither simple text nor voice. Most apps require data. Using the browser provided with the phone requires data. Playing videos and games and sending selfies to your friends require data. The amount of data that consumers need varies greatly, depending on how much they use their phones to do just about anything other than make phone calls, send texts, or take photos. Younger people, in particular, tend to use their phones for nearly all communication and information access and sharing. Thus, they tend to use more data. Data plans can be limited. This means that the carriers can either automatically charge fees for every megabyte of data used over the limit or cut off data services after the data limit is met. Data plans can also be

unlimited, so that the plan members can do as much searching, viewing, and sharing as they like. Consumers should carefully consider how much data comes in a family plan to avoid overage charges if family members use a lot of data every month.

“Phones in plan” refers to the maximum number of phones covered in the plan for one family. Most providers place a limit on how many phones are included in the plan for the price. Some providers allow additional phones to join the family plan at a discounted price. Others charge full price for every additional phone over the number included in the plan. For example, if a family plan includes four phones, but a family has six people with phones, the family would have to pay more money to buy the same plan for the additional two people beyond the four phones included.

“Automatic billing discount” refers to whether and how much money the provider will take off the regular plan price if the account holder (the person paying the bill) allows the provider to automatically collect the money from the account holder every month, instead of waiting for the account holder to pay the bill. Usually the provider obtains payment by automatically charging a credit card on the same day every month or by automatic transfer of funds from the account holder’s bank account. This process guarantees payment for the provider, and sometimes plans include a discount for that guarantee.

Our top picks

Based on a comparison of dozens of family plans that the largest networks offer, we rate the following four plans as best in offering the greatest value for the features most commonly desired by families:

Keep reading >>

TEXT 1

Your Guide to Cell Phone Plans, continued

| Plan | Nationwide coverage | Unlimited talk | Unlimited text | Data/month | Phones in plan/cost for additional phones | Discount for automatic billing | Price/month |
|------|---------------------|----------------------|----------------------|------------------|---|--------------------------------|-------------|
| A | Yes | Yes | Yes | 2.5 GB per phone | 4/\$99 each | \$10/month | \$250 |
| B | Yes | Yes | Yes | 1 GB per phone | 4/\$25 each | None | \$250 |
| C | Talk only | Yes | Within coverage area | 5 GB per phone | 5/\$30 each | \$15/month | \$225 |
| D | Text only | Within coverage area | Yes | 5 GB per phone | 4/\$99 each | \$10/month | \$225 |

TEXT 2

Angela's Odyssey

My friend Jamellah grabbed my arm as we strolled by the grocery store.

"Angela," Jamellah squeaked, pointing to a flamboyant poster in the window, "Dream Tiger is performing next month here in town—we have to get tickets!"

Dream Tiger was a local band that had swiftly gained an avid following on every form of social media possible. Jamellah and I had even heard rumors that the band would appear on the popular television show *Sing It Out*.

Jamellah was already texting our friend Meagan with the news when another much-less flashy notice caught my attention. The local animal shelter was sponsoring a 10-kilometer run for fundraising purposes.

Usually, I ignored announcements like that, especially since I'm not the athletic type. However, several months ago, I adopted my cocker spaniel puppy, Speckles, from that shelter, and the director, Ms. Winfred, was my hero. When Speckles slipped through our fence and escaped, I called Ms. Winfred in a desperate panic to see if anyone had brought in my missing pet. Ms. Winfred said no but gave me some tips where to look for Speckles. Ten minutes later, as I scoured the neighborhood, I found my runaway puppy keeping a hotdog street vendor close company. Despite my eagerness to help raise money for the shelter, I wondered if I could just walk the 10-kilometer course.

"Earth to Angela—are you alive?" Jamellah asked, jolting me back to reality.

"Yeah," I smiled, but I didn't mention that I was contemplating entering the run; Jamellah would likely laugh so hard she'd collapse. It was much wiser if I pursued this undertaking on my own.

Later that afternoon, I took Speckles for a walk to the animal shelter to ask Ms. Winfred a little more about the charity run. She explained how the participants would collect sponsors to pledge a donation for every kilometer they completed.

"The shelter is hoping to raise enough funds to turn that ugly vacant lot behind our building into a grassy dog park," Ms. Winfred explained. "We plan to plant trees and a flower garden and add some wooden benches," she continued, her dark eyes glinting at me. "I'm sure you've come for an entry form, right?"

My mouth went as dry as the Sahara Desert, but I nodded my head anyway. I didn't want to disappoint Ms. Winfred, and I refused to let 10 kilometers intimidate me.

I may not be a natural-born athlete, but I'm an expert at organizing and scheduling. I divided the month remaining before the race into weeks and decided what distance I should run each week to build my endurance. My agenda looked simple and logical on paper, but when I attempted to run my first mile on Saturday morning, I had to lurch to the roadside three times, my sides heaving as I caught my breath, and I got a blister on my heel. When I finally limped through my front door, I heard our phone ringing. It was Jamellah.

"Do you want to go to the city pool and swim this afternoon?" Jamellah chirped.

Keep reading >>

TEXT 2

Angela's Odyssey, continued

"Not . . . not today," I stammered; merely climbing our front steps had felt like scaling a cliff.

"Um okay," Jamellah conceded, but she sounded slightly irritated. Fortunately for me, her brother was hollering for her in the background, so she mumbled, "See you later," and hung up without requesting any explanation.

For the next week, I diligently stuck to my training schedule, coaxing my protesting, aching muscles a little farther each passing day—down to the fishpond in the park, then past the baseball field, then to the water tower at the edge of town. I kept expecting to suddenly leap out of bed in the morning, feeling like a superhero, but instead I continued to wake up with sore muscles. Therefore, I turned down Jamellah's request to join her and the other volunteers cleaning the park and her invitation to the community play. I figured I'd tell her everything in three weeks, but a day later, she showed up on my doorstep with her beach bag, expecting me to go with her to the pool.

"I'm not really up for swimming," I mumbled.

Jamellah's head drooped, and she stared at her flip flops for a long moment. Then she slowly raised her eyes, and the bewildered, abandoned look in them reminded me of Speckles when I put him in his kennel for the night. "I won't keep bothering you," she murmured.

At that moment, something inside of me started crumbling in defeat—I couldn't do this; why had I thought it was possible? In a flood, my foolish, grandiose plans gushed out of me, and Jamellah listened silently, until I sputtered, "I'm sorry for ignoring you—don't be upset."

"I *am* annoyed with you—but not for ignoring me," Jamellah retorted, pinning me with her sharp gaze as she planted her hands on her hips. "I'm upset because you didn't think I'd help you!"

"I can't do it anyway," I countered, deflated.

"Maybe you can with a crew," Jamellah argued, and, without a pause, she launched into the plot from a book she had read—*The Odyssey*.

"The main character, Odysseus, struggles to return home against overwhelming obstacles, and his loyal crew is at his side," Jamellah explained. "I'll be your crew. I can borrow my brother's bicycle and ride along with you while you train. That'll distract you from your aches and pains, and I can help you get more names for sponsors, too; I have a million relatives!"

"You won't have any time for swimming," I warned, still half hoping to win a reprieve.

"I can bike instead for a couple of weeks," Jamellah replied, playfully directing me toward my front door. "Come on—you have to show me that training schedule—it's our map for completing your odyssey!"

For the next 21 days, Jamellah became my steadfast running partner, regardless of the suffocating heat, soggy drizzle, or pelting rain. She sang our favorite Dream Tiger songs, brought me bribes—like my favorite gourmet jelly beans—and always pushed me one foot farther when I planned to stop. By the fourth week, I actually ran five miles without gasping for breath.

However, on the morning of the race, my stomach twisted into jumbled knots, and my confidence waned.

Keep reading >>

TEXT 2

Angela's Odyssey, continued

"You're going to do this, Angela," Jamellah declared from the sidelines, and I acknowledged her words with a tense nod.

Seconds later, the starting bell shattered the morning with its noisy clang. Instantly, I shot forward like a bolt of lightning, making a common mistake for a rookie—I didn't pace myself. Even Jamellah, who has less running experience than I do, hollered, "Slow down—you're not going to make it to the end if you go that fast!"

My bottled, nervous surge of energy carried me for several kilometers, but then my legs turned into cement pillars, and each stride seemed to demand an enormous effort. Jamellah appeared at the three-kilometer marker, and I was shuffling along the side of the course, ready to quit.

"I messed up big time; I'm going to die before I finish," I half choked, but Jamellah firmly shook her head, not offering me one ounce of sympathy.

"I'm sure you can walk for another kilometer," Jamellah insisted.

"Remember, your sponsors are paying by the kilometer, so every step counts."

For the remainder of the course, Jamellah continually appeared whenever I planned to bail as if she could read my mind. Finally, I navigated the last corner and glimpsed the finish line with a sob of relief. When I stumbled across that bright red mark, I felt like a mountain climber planting a flag on the summit.

"You did it—we raised \$300 for the shelter!" Jamellah whooped and shouted, enveloping me in a sweaty victory hug.

"I couldn't have done it without you," I blubbered, and, as crazy as it sounds, I announced, "I want to enter another race."

Jamellah didn't seem shocked or amazed; she just laughed aloud and matter-of-factly declared, "That's great because I've decided I like biking."

TEXT 3

Listening with Their Knees

Singing and hearing songs

Think about sitting outside on a warm summer’s evening. Is it completely quiet? Or do you perhaps hear a chorus of chirps coming from an orchestra of crickets?

Crickets are known as some of the noisiest nighttime creatures. Scientists believe that crickets make sounds to help them find mates through one specific type of song—and to warn other crickets to move out of their territory with another type of tune.

Given that crickets make these sounds to both attract and warn other crickets, scientists know that they must have a type of ear that allows them to hear.

Ears in a surprising place

A simple look at a cricket tells you that the insect does not have an ear structure located on its head. Thorough examinations of the head area confirm this to be true. Therefore, scientists have studied other parts of the insect’s body to see where these hearing capabilities might be located, and they made a fascinating discovery. Crickets—and other members of the order Orthoptera, like grasshoppers, locusts, and katydids—have ears on their knees. And these ears are some of the smallest ears in the animal kingdom, measuring much less than a millimeter in length.

Micro-CT scans in action

Scientists studied a katydid from South America to find out more about these knee-ears. Using advanced technology (micro-CT scans), they found that the Orthoptera’s ears have structures surprisingly similar to human ears. They have thin tympanal membranes like human eardrums, a fluid-filled tube like a cochlea, a line of sensitive cells like the hair cells in the cochlea, and a tympanal plate like the hammer, anvil, and stirrup in the inner ear of humans.

Knee-ear and human ear similarities

The knee-ears work in a similar fashion to human ears. The thin membranes collect the sound waves and start to vibrate. These sound vibrations are then passed on to the tympanal plate. Next, they’re transferred to the fluid-filled tube. The waves are amplified in this tube and move farther down the sensitive cells. These cells are set up like a piano: they detect high-frequency sounds at one end and low-frequency sounds at the other. The cells send information about the frequencies to the insect’s nervous system, allowing the insect to respond appropriately by running away or moving closer. This process is exactly how sound moves through our ears, too.

Real-world applications

Not only did the discovery of knee-ears lead to a better understanding of the order Orthoptera, but it also excited engineers. They could potentially use this discovery to develop very tiny microsensors. These sensors could be used for a variety of purposes, for instance, maybe in the development of improved hearing aids and small sound-sensitive robots.

Keep reading >>

TEXT 3

Listening with Their Knees, continued

Structural similarities

| Ear structure in Orthoptera ears | Similar ear structure in human ears |
|---|---|
| Thin tympanal membrane | Eardrum |
| An uncoiled acoustic vesicle, a hollow tube filled with fluid | Cochlea |
| Crista acustica, a line of sensitive cells | Hair cells in the cochlea |
| Tympanal plate | Hammer, anvil, and stirrup in the inner ear |

TEXT 4

Bioluminescence

Perhaps the most recognizable example of bioluminescence is the lightning bug, or firefly, depending on which part of the United States you live in. Whatever you call these insects, we have all seen them in the early evenings, flashing on and off, on and off, and maybe have tried to catch one or two. That little bit of flickering light is a simple chemical reaction known as “bioluminescence.” Most of the creatures able to create or use bioluminescence are marine creatures, and all of those are fish living in the saltwater oceans; there are no bioluminescent fish in freshwater sources.

Two chemicals are involved in making the bioluminescence reaction: luciferin and luciferase. The color of light produced by the reaction is determined by the luciferin molecules. Many creatures make luciferin themselves and so can contain the reaction themselves; others must integrate luciferin into their system either by eating another animal containing luciferin or through a symbiotic relationship with a luciferin animal.

Bioluminescence has been a part of not only science but history and art as well. It was first observed by the philosopher Aristotle (384–322 BCE) and the elder Pliny (AD 23–79); Christopher Columbus and Charles Darwin made mention of seeing glowing creatures during their explorations.

One of the best-known marine animals to use bioluminescence is the anglerfish. Anglerfish have big heads; large, sharp teeth; and a filament rising from the center of the top of their head that ends with a ball hanging in front of their face. This ball can flash light, attracting prey by causing them to be curious about the light, which also blinds them to the anglerfish’s large teeth. The light might also attract predators, but

the anglerfish is able to control the flashing so that it can flash in the face of a predator to scare it away. The dragonfish is another example of bioluminescence, unusual in its use of red light, which other fish cannot see, so it can see its prey more easily and hunt more efficiently. Another example is some forms of bacteria that float on the ocean, creating a beautiful, glowing scene for those on the beach.

“Bioluminescence is not the same thing as fluorescence, however. Fluorescence does not involve a chemical reaction. In fluorescence, a stimulating light is absorbed and reemitted. The fluorescing light is visible only in the presence of the stimulating light. The ink used in highlighter pens is fluorescent. Phosphorescence is like fluorescence, except the phosphorescent light can reemit light for much longer periods of time. Glow-in-the-dark stickers are phosphorescent.”

Besides the lightning bugs and fireflies we discussed earlier, other land animals have bioluminescent qualities. Click beetles have three spots where they glow steadily: two on the side of their heads and one on the bottom of their body. A beetle in Brazil keeps its larvae in termite mounds; the beetles begin to glow in the evening to attract their flying prey, including the termites from the mound in which they live. Unfortunately, there are also glowing, bioluminescent cockroaches; fortunately, they have been found only in South America. Finally, the railroad worm, vaguely related to fireflies, has eight(!) pairs of tail lamps that glow, like a firefly’s, and one head lamp. Watching these worms fly and light up at night is almost like watching a real train!

TEXT 5

Can I Be What I Want When I Grow Up?

Everyone is telling me I need to figure out what I want to do with my life, but no matter who I talk to about what I want to do, I get one of three reactions: a smirk, a fake smile, or “What’s your back-up plan?” It’s so frustrating. On the one hand, everyone tells me I can do whatever I want. I should pursue a job that makes me happy because that’s a key to success in life. However, wanting to be a professional softball player doesn’t seem to make the list of acceptable jobs.

I’ve played softball since I was six. I am captain of my high school team, where I pitch and play left field. Things are looking good for receiving a scholarship to play fastpitch softball at a university. Why wouldn’t the next step be professional ball?

My mom offers plenty of reasons. Mostly, she is worried about my health. She is convinced I’ll end up a statistic, and she even looked up some statistics about baseball injuries. At the pro level, injuries are common. They happen every day. This, at long last, gave me an opportunity to use what I was learning in math class. Mrs. Cohen taught us about how statistics can be misinterpreted and misapplied to make arguments. First, my mom cited baseball statistics, not softball. So I looked up the college softball statistics from the same source she had, and I found that for the same time span, only two serious injuries occurred.

Mom was not deterred. She’s been with me throughout my little league and high school years and has always been outspoken about safety. So, just to remind me what I might be in for, she found more specific reports about softball injuries in high school, college, and pro ball. It turns out that the most injuries occur when base running.

In fact, the most common softball injury is a sprained ankle, which accounts for 10% of all injuries. While ankle sprains can occur when twisting and rotating in the field, they most often happen when sliding into bases. Three of the next four most common injuries are knee injuries, upper leg injuries, and concussions. These also most often occur while base running.

The other injury in the top five affects pitchers. Since I run bases and pitch, those are two strikes for me. Because of the windmill-like motion with which fastpitch softball pitchers throw the ball, a tremendous amount of pressure is placed on the upper body—particularly the back, neck, shoulder, forearm, and wrists. This pressure can result in tendonitis, rotator cuff, and back-of-the-shoulder injuries. In fact, my mom pointed out, one recent study found that more than half of college softball pitchers reported shoulder injuries that required medical attention.

This story sounded pretty bad. I needed to find out more. What I learned from reading articles about what doctors say about softball injuries is that it is one of the safest sports for young people to play. Further, the data on softball pitching injuries is changing and inconclusive. While players and coaches say that most pitching injuries can be avoided by improving pitching technique that minimizes strain, many orthopedic doctors argue that having no limits on the number of pitches and pitching back-to-back games can cause strain injuries, no matter how good the technique. Fortunately for me, placing limits on pitches per game is currently a hot debate, and there could be limits by the time I’m in college.

Keep reading >>

TEXT 5

Can I Be What I Want When I Grow Up?, continued

Having dispensed with the injury argument, in my mind at least, I felt vindicated. That is, until I spoke with my school counselor. She didn't play hard ball with statistics, like my mom. Instead, she focused on the idea of softball as a very risky and difficult career. She gave me some articles to read about the instability of this relatively new professional sport and the tough financial and career choices women's pro softball players must make.

My counselor is right to have me think about choosing a career that will exist years from now. But I don't think the fact that women's professional softball is less popular or established as professional baseball means I should give up on pursuing it. It's true that, as a pro sport in the United States, it's only been around on and off since the mid-1970s. It's also true that, mostly due to financial reasons, leagues operating the sport have come and gone, and changed ownership, names, and management. And, yes, although many teams have played for the current league, only two of them have been around since 2005—and one of those two has changed names and home cities.

A few other points also make me question how likely it will be that I'll succeed as a professional player. Because there are so few pro softball teams, each with 20–25 players, only the best, most dedicated of the elite players go on to play professionally. You might think this would be good news because the games are amazing to watch when only 1% of the top college players are playing each other. However, it also means that I will have to be in the top 1% of all college players to really have a chance to play professionally. I know I'm a good enough player to get a college scholarship, but I'm not sure I'll be in the top 1%.

Here's the other part that's difficult to comprehend: You would think since the women who play professional softball are in the top 1% of the best players, they would earn a good salary and dedicate their professional lives to keeping their skills sharp. If you thought that, you'd be wrong. Most pro softball players make \$5,000–\$8,000 annually, with a few of the very best making \$50,000. This means that nearly all of them must have other jobs to support themselves. Because the softball season is three months during the summertime, in addition to finding another job, a woman who wants to play pro softball must find that job in a field that allows her a lot of time off in the summer. This means my career choices will be limited. That is a serious consideration.

Despite all those concerns, I am determined to take some of the advice I've heard most of my life: do what you love to do. I love playing softball. Professional softball encourages college-educated women to hone their athletic and teamwork skills. The game is a source of family fun and entertainment for millions of people, and I believe that once enough people see how exciting it is, it will grow in popularity. If I work hard enough, I might someday be considered a pioneer in the game.

SECTION G

Learning Center 4: Teaching Reading Through Content and Media



Critical Thinking Framework Example

Critical thinking framework, part 1

| | | |
|--|--|---|
| <p>Text</p> <p>“Vertical Gardens” May Be the Answer to Farming in Crowded Spaces, by Scientific American®, adapted by Newsela staff, 2015</p> <p>https://newsela.com/read/vertical-gardens/id/7262/ (930 Lexile level)</p> | <p>Content area</p> <p>Social Studies</p> | <p>Nebraska Content Area Standards</p> <p>Geography: Human/Environment Interaction</p> <p>SS 8.3.5.c Analyze issues related to the physical environment globally (e.g., water supply, air quality in cities, solid waste disposal, availability of arable land)</p> |
| <p>Essential question</p> <p>How do the movements of water affect Earth and its systems? How does climate change affect different communities?</p> | | |

Critical Thinking Framework Example, continued

Critical thinking framework, part 2

| Within the text/content | |
|---|---|
| <p>Literal understanding</p> <ul style="list-style-type: none"> • What does the content say? | <p>Analytical understanding</p> <ul style="list-style-type: none"> • How does the author convey his or her meaning? • What does the author imply? |
| <p>Text-dependent analysis prompts</p> <ul style="list-style-type: none"> • What changes have the people of Bangladesh had to implement because of the flooding? • What are the benefits of vertical gardens? | <p>Text-dependent analysis prompts</p> <ul style="list-style-type: none"> • After “the storm sent salty water surging into farmlands . . . , [and] vegetable crops . . . produced small harvests,” what changed in Chandipur? |
| <p>Anticipated student responses</p> <ul style="list-style-type: none"> • People have changed how they farm by building vertical gardens • Vertical gardens ensure crop health by protecting them from floods and salt in the soil | <p>Anticipated student responses</p> <ul style="list-style-type: none"> • The crops failed or didn’t produce enough for people to eat, so Chandipur had to change the way it farms |
| <p>What potential media content could you pair with this text?</p> <p>Why Climate Change Makes Storms Stronger, from Yale Climate Forum, https://www.youtube.com/watch?v=2K2s2EjsXJI</p> | |



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