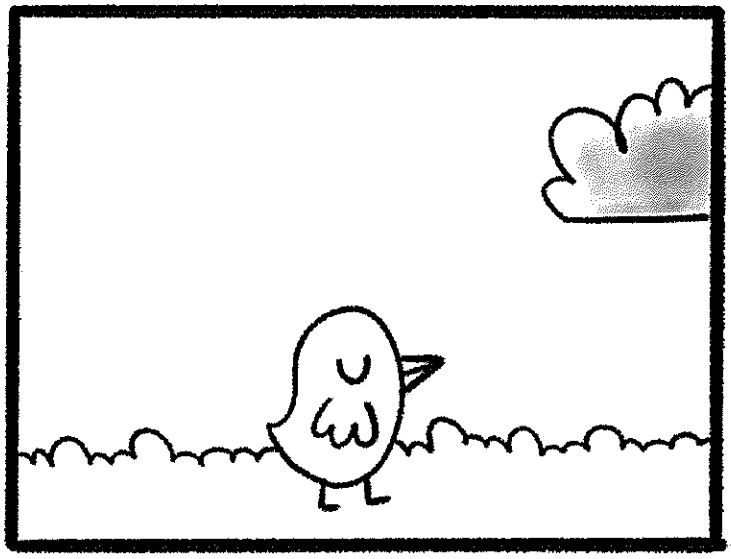
8th Grade Packet

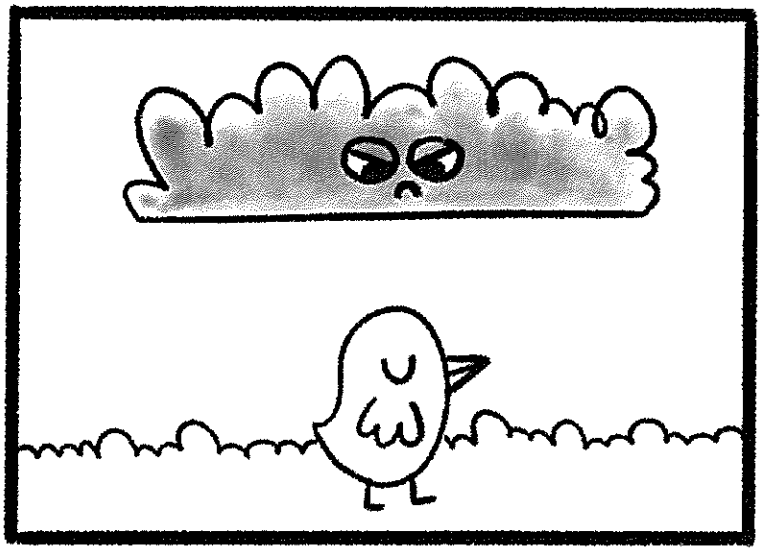
Used All Week:

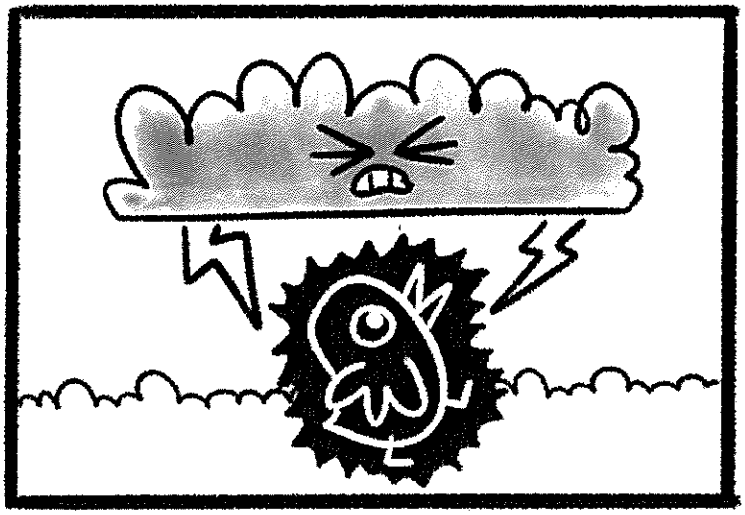
- ELA: Finish this Comic: Complete a Comic a day
- Math: Transformations Focus
- SS: African Americans in Colonial Society
- Science: Instructions for Close Reading

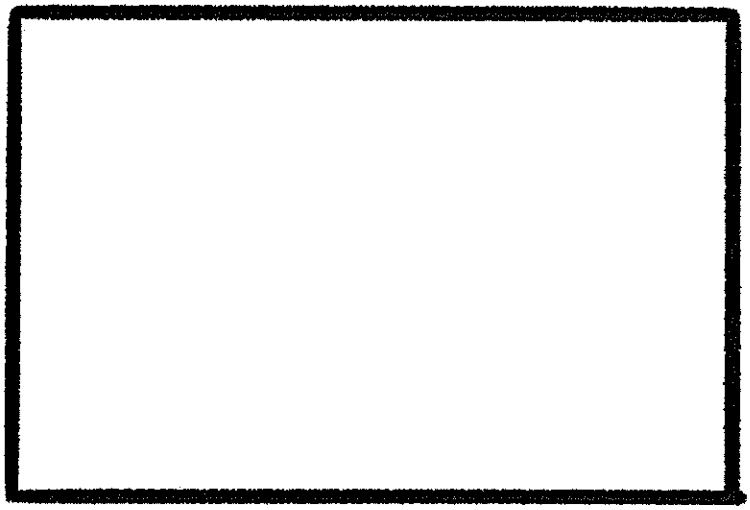
	ELA	Math	Social Studies	Science
Day 1	**Reading Passage:** The Woolly Mammoth	**Concept Review:** Transformations Focus Practice Problems	**Review: African Americans in Colonial Society History Lab:** How Should George Washington Be Judged on the Issue of Slavery ***This will be used for all 5 days**	Close Reading: Clues to Ancient Life
Day 2	**Reading Passage:** Malai's Mission	**Concept Review:** Transformations Focus Practice Problems	**Review: African Americans in Colonial Society**	Close Reading: Yellowstone Supervolcano
Day 3	**Reading Passage:** The Amazon Rainforest	**Concept Review:** Transformations Focus Practice Problems	**Review: African Americans in Colonial Society**	Close Reading: Nuclear Power
Day 4	**Reading Passage:** The Reader	**Concept Review:** Transformations Focus Practice Problems	**Review: African Americans in Colonial Society**	Close Reading: Types of Renewable Energy
Day 5	**Reading Passage:** High Jumpers	**Concept Review:** Transformations Focus Practice Problems	**Review: African Americans in Colonial Society**	Close Reading: It's Not Easy Being Green... Or is it?

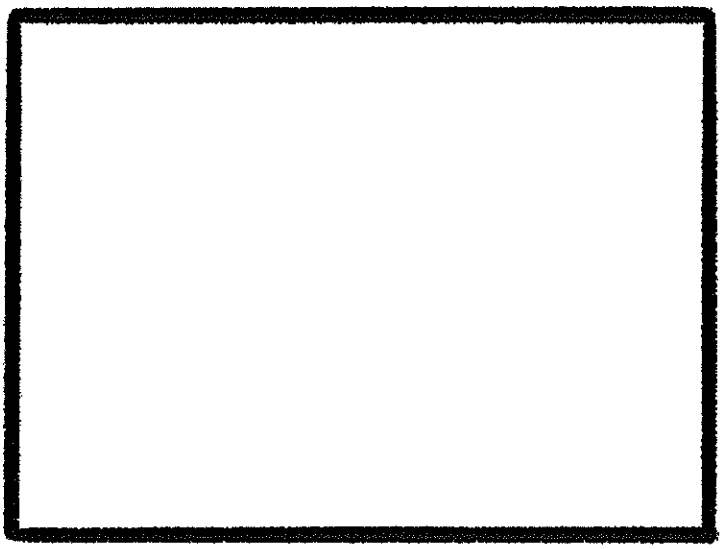
FINISH THIS COMIC!

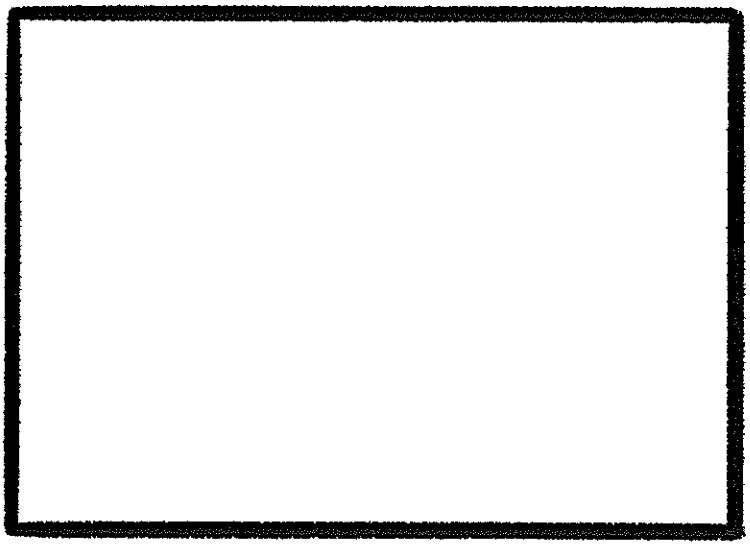








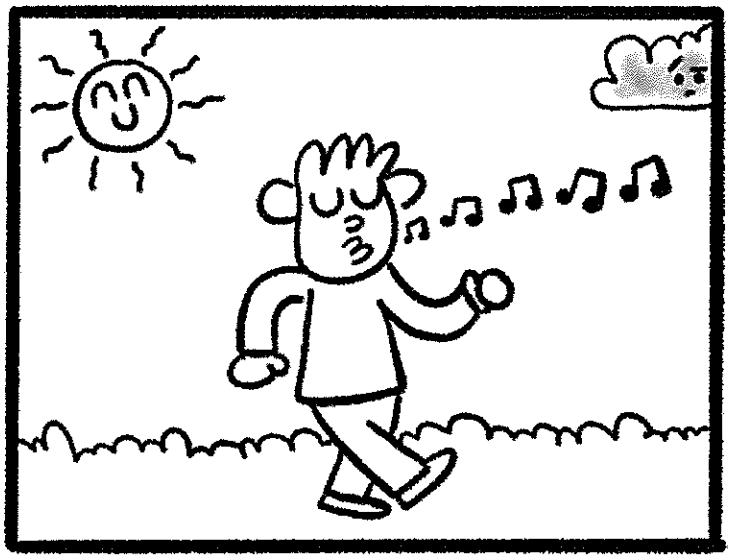


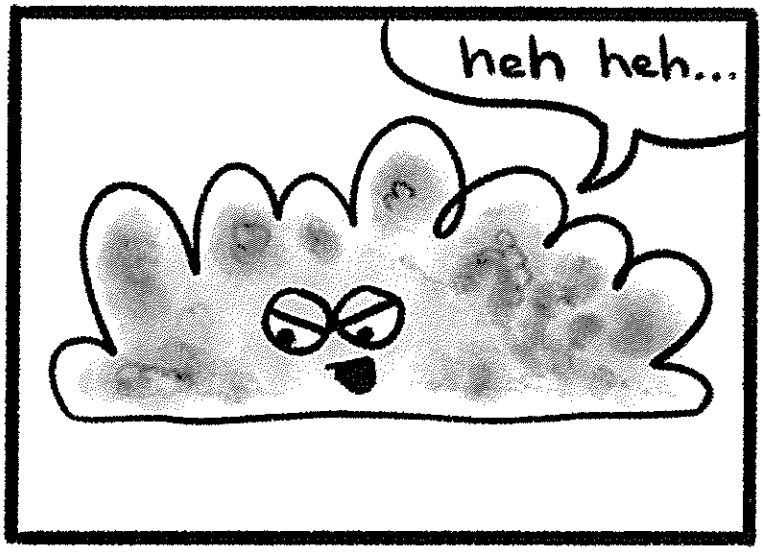


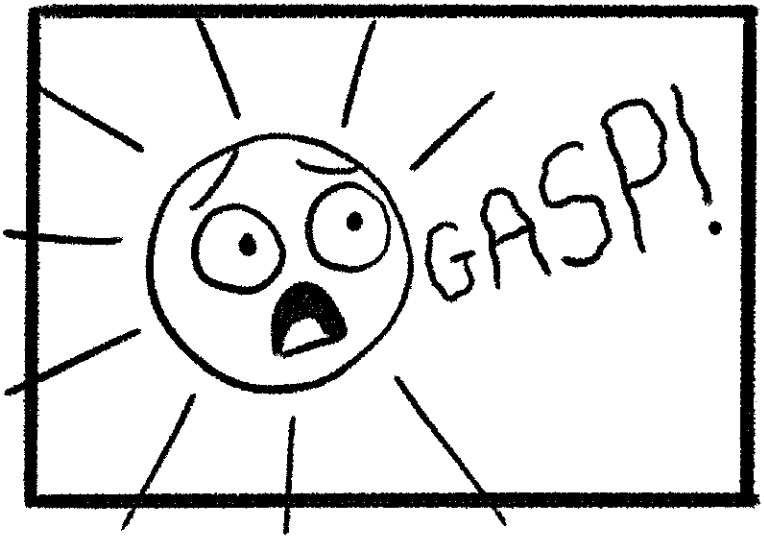
JARRETT

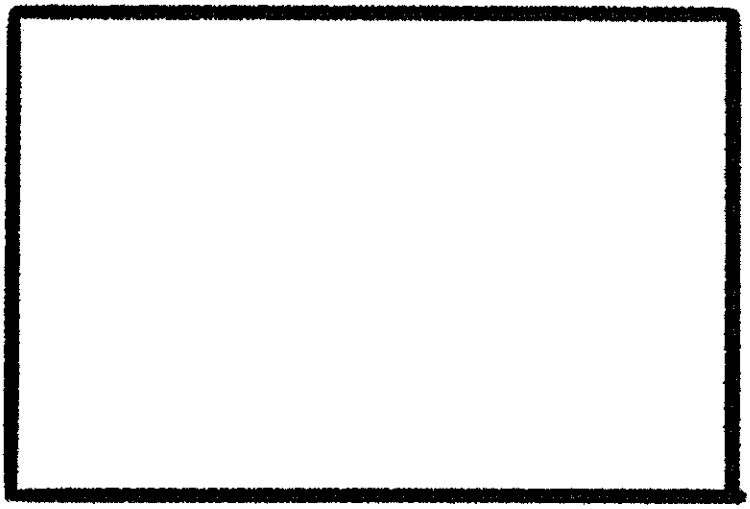
jarrettlerner.com

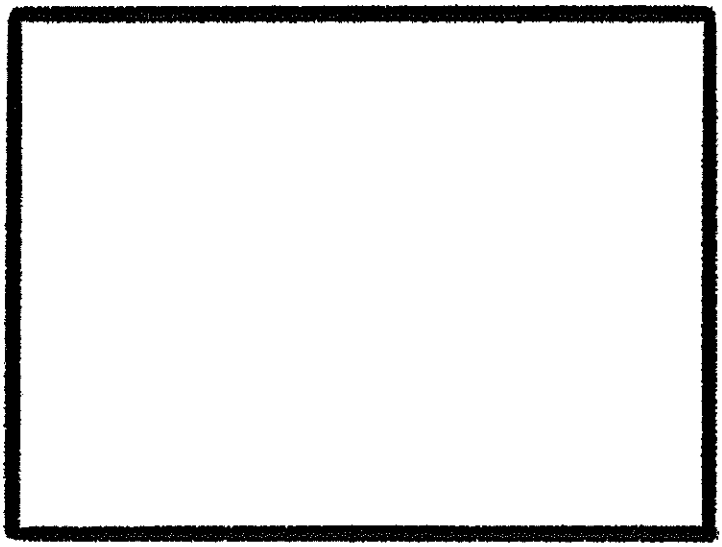
FINISH THIS COMIC!

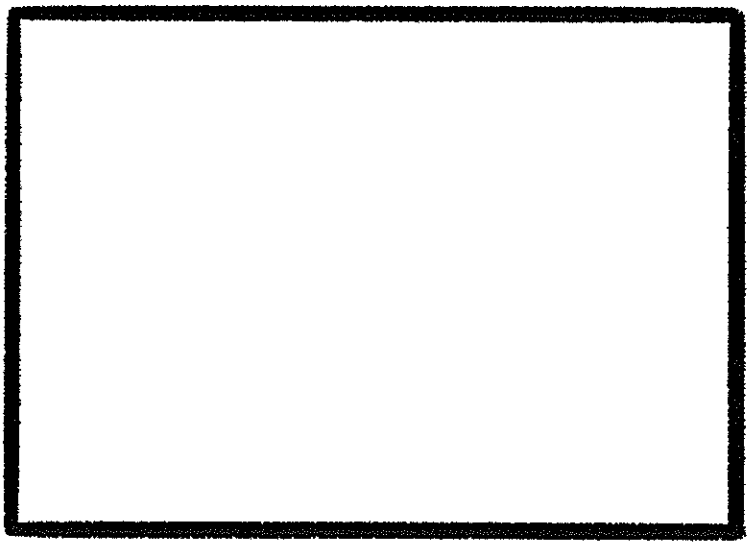








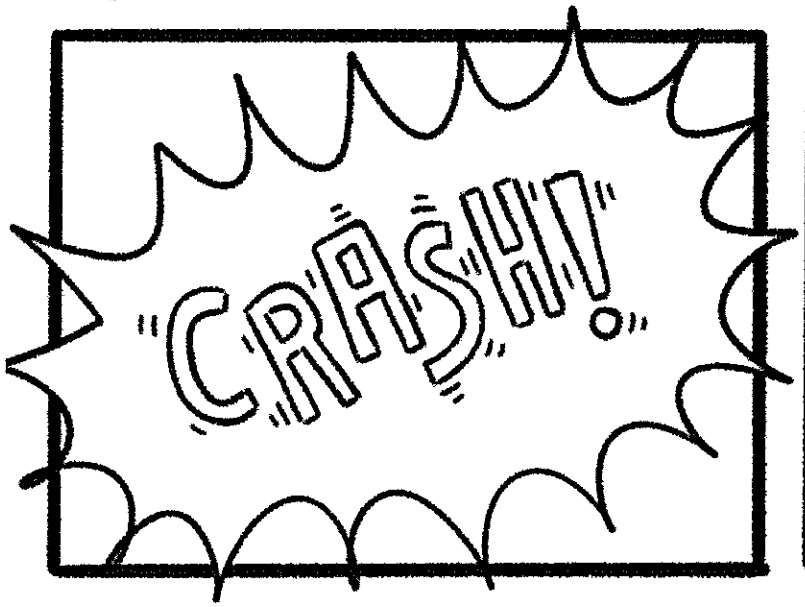


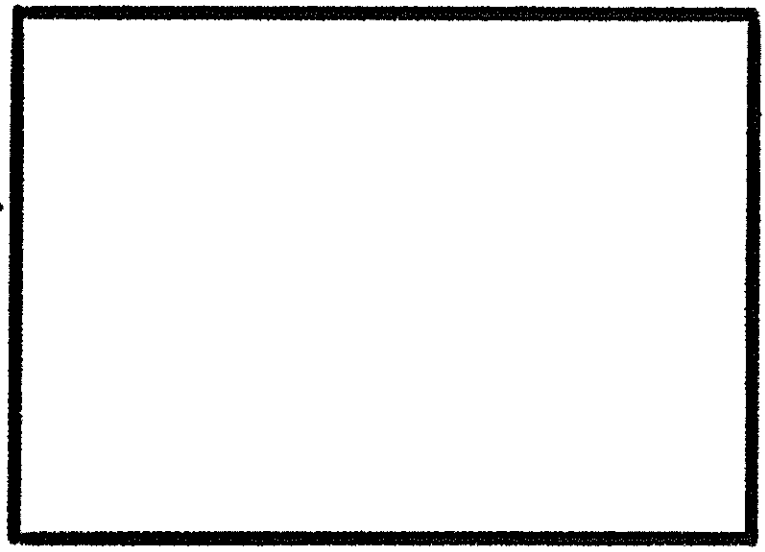


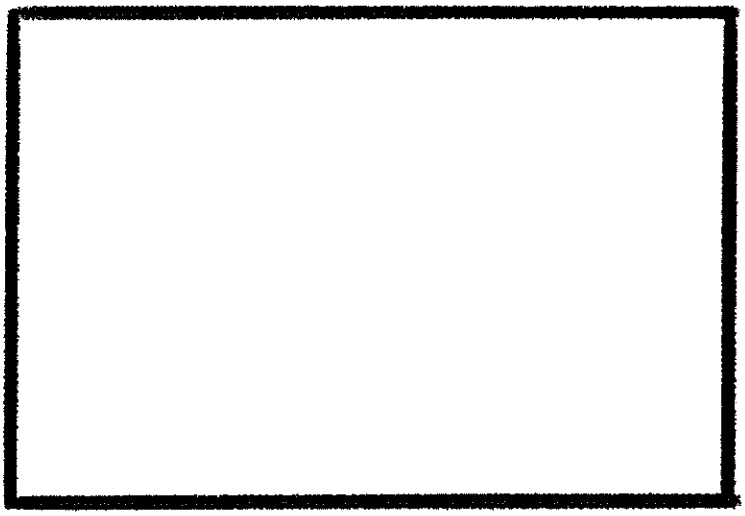
JARRETT

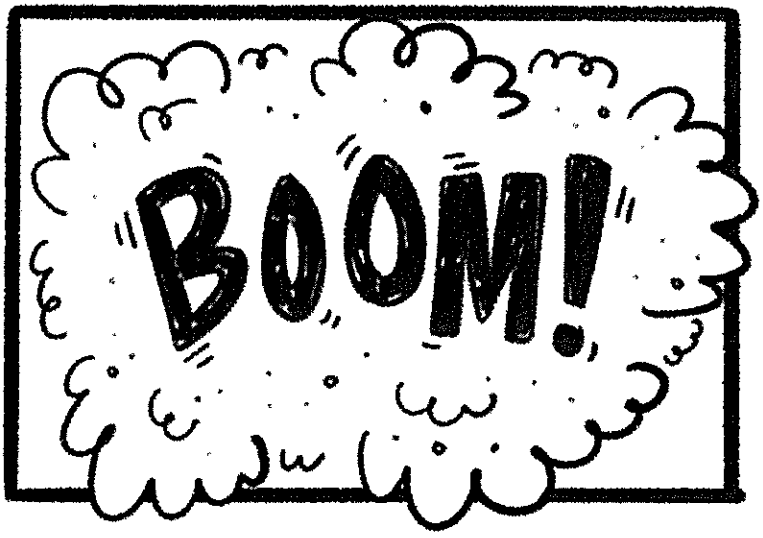
jarrettlerner.com

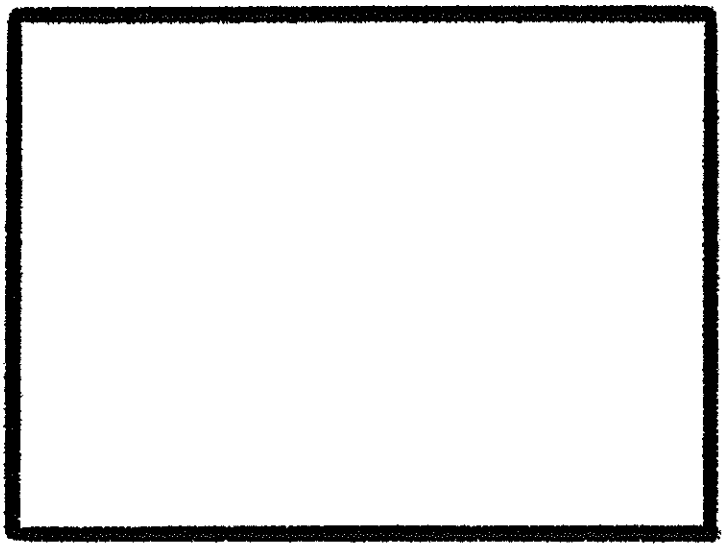
FINISH THIS COMIC!







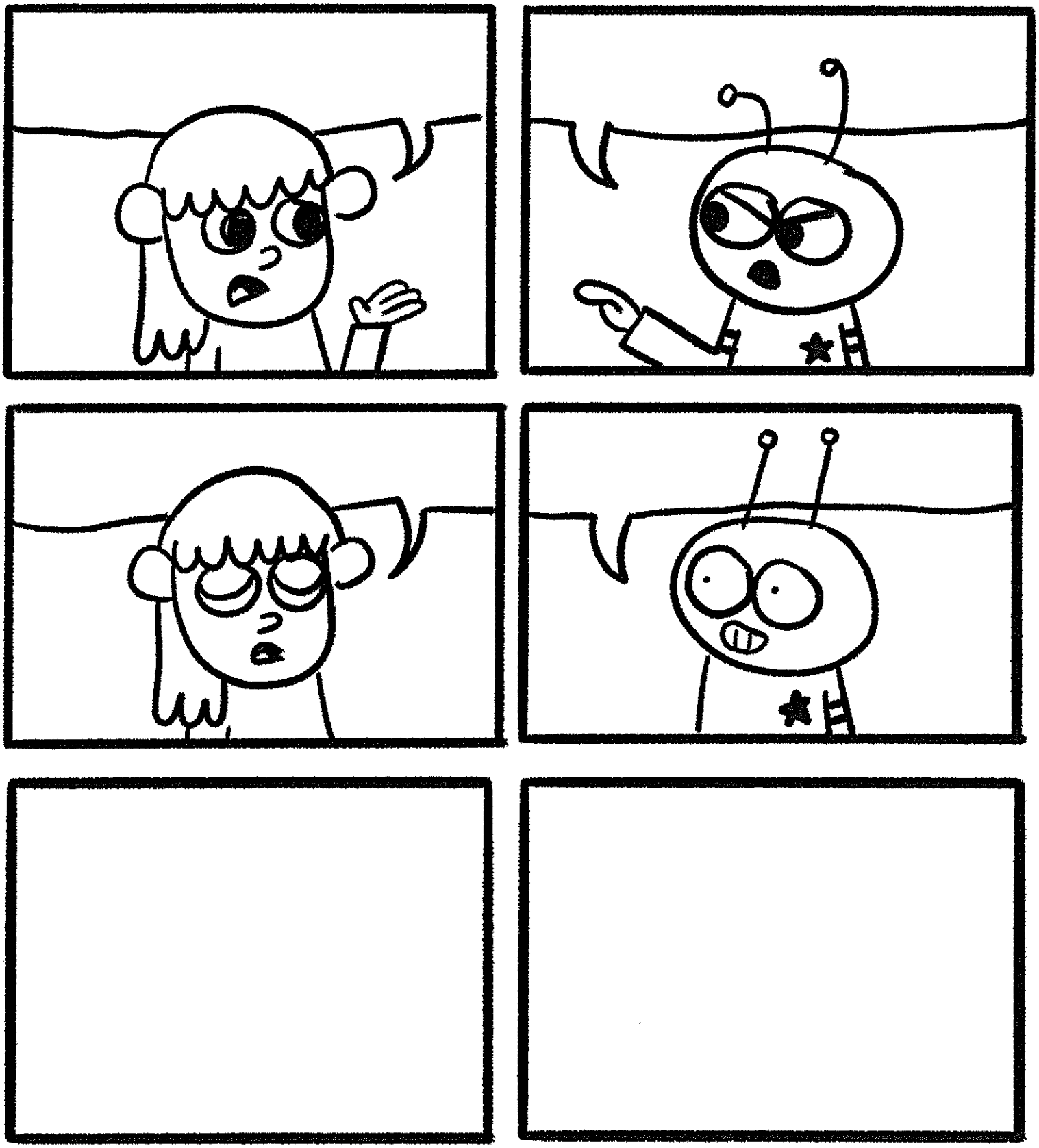




JARRETT

jarrettlerner.com

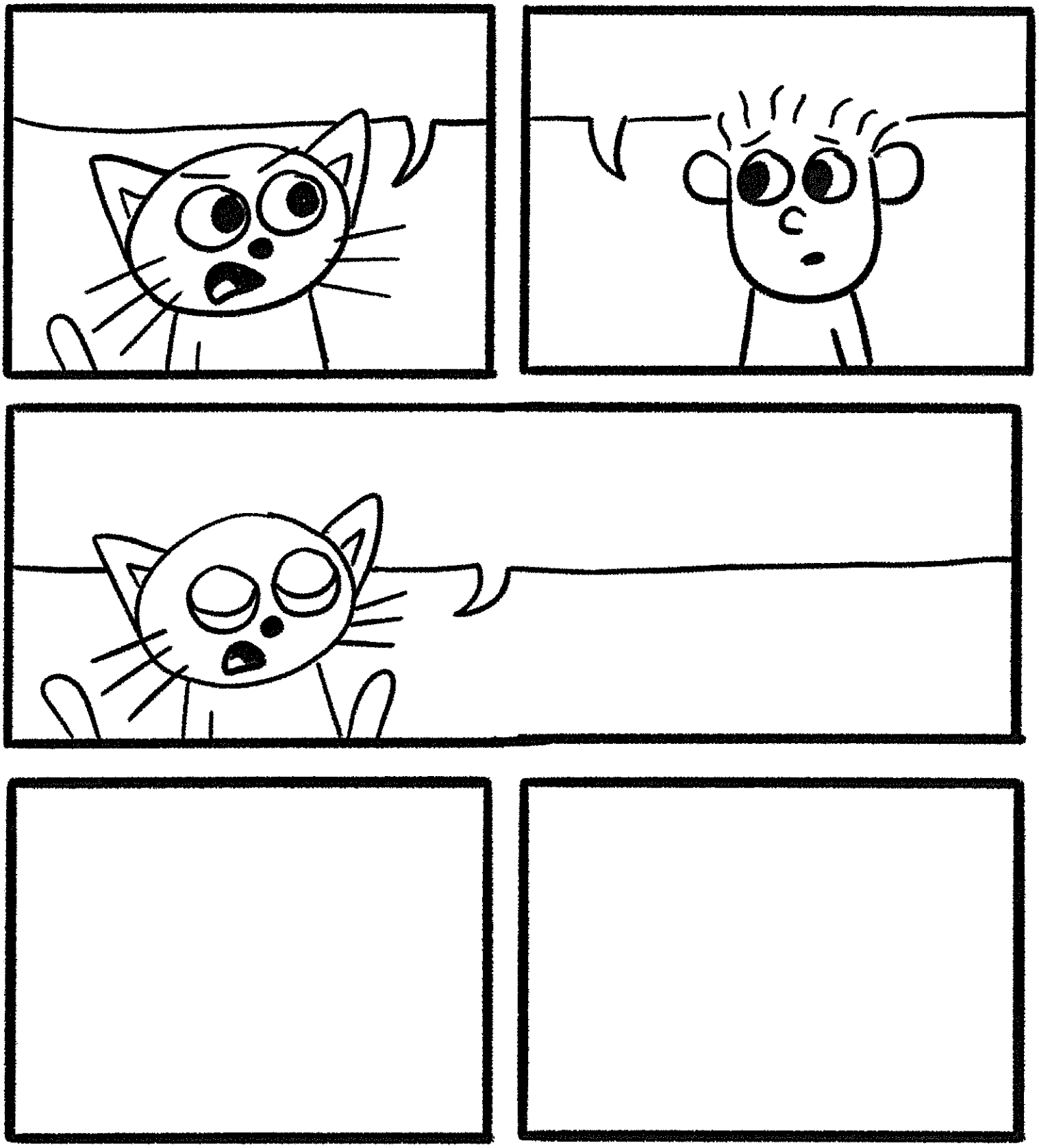
FINISH THIS COMIC!



JARRETT

jarrettlerner.com

FINISH THIS COMIC!



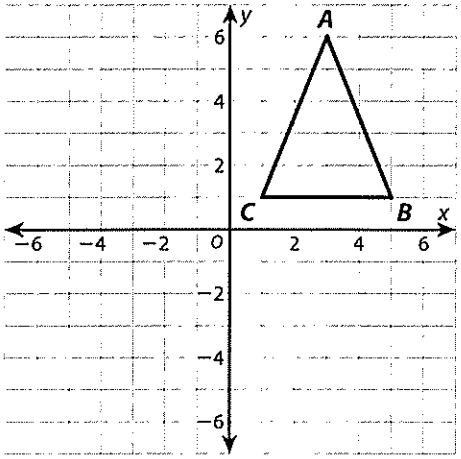
JARRETT

jarrettlerner.com

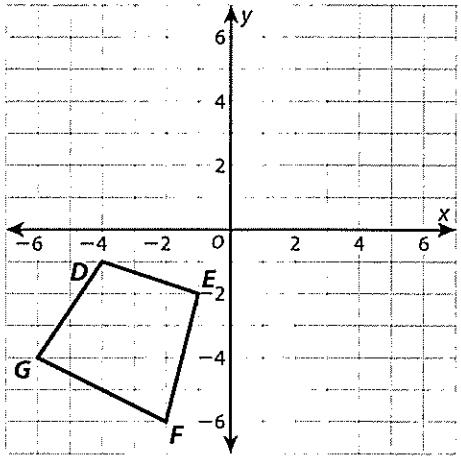
Performing Sequences of Rigid Transformations

➢ **Perform the given sequence of transformations on each figure. Write the coordinates of the vertices of the final image. Then tell whether the final image is congruent to the original figure.**

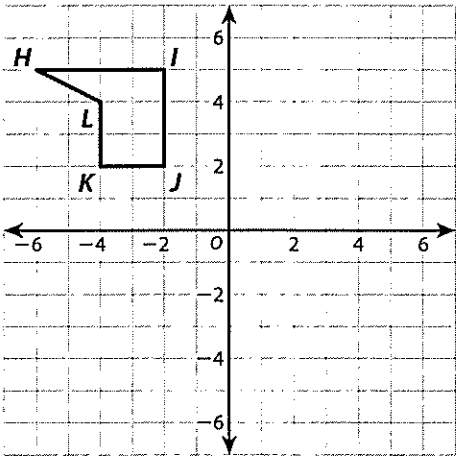
1. Reflect across the *x*-axis. Translate 5 units left.



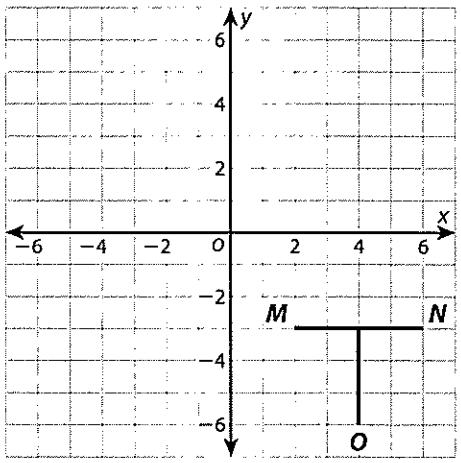
2. Rotate 90° clockwise around the origin. Reflect across the *x*-axis.



3. Translate 2 units right and 4 units down. Rotate 180° around the origin.

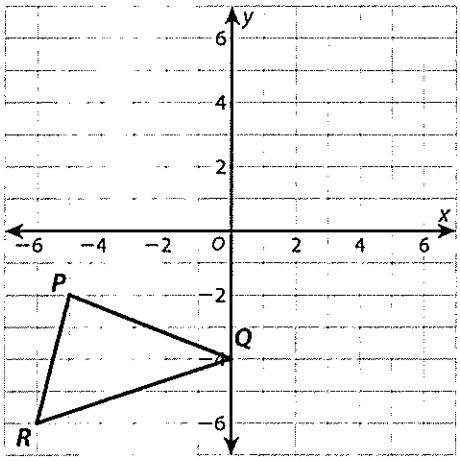


4. Reflect across the *x*-axis. Rotate 90° counterclockwise around the origin.

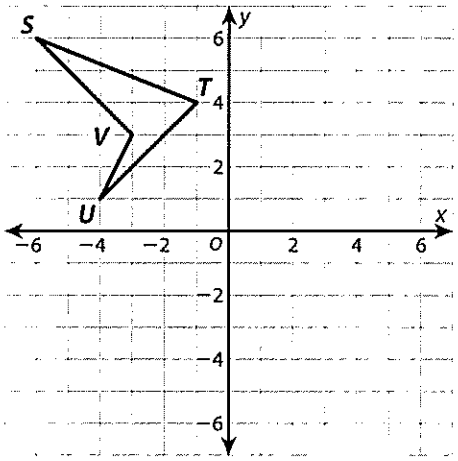


Performing Sequences of Rigid Transformations *continued*

5 Reflect across the *y*-axis.
Translate 5 units up.
Rotate 90° clockwise around the origin.



6 Translate 6 units right.
Rotate 180° around the origin.
Reflect across the *y*-axis.

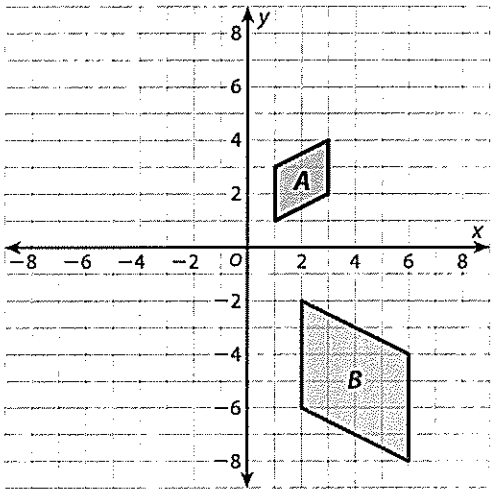


7 How did you determine the label for each vertex when you transformed the triangles in problem 5?

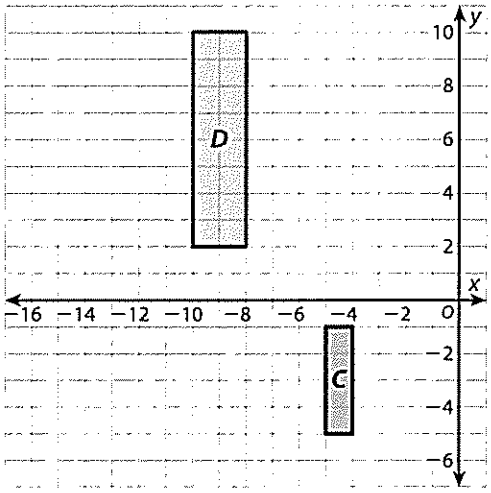
Describing Sequences of Transformations Involving Dilations

➢ **For each pair of figures, describe a sequence of three or fewer transformations that can be used to map one figure onto the other.**

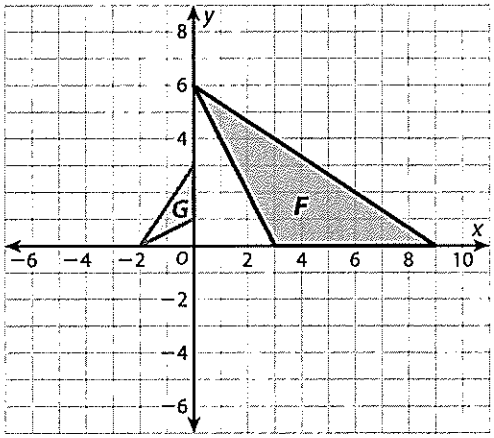
1



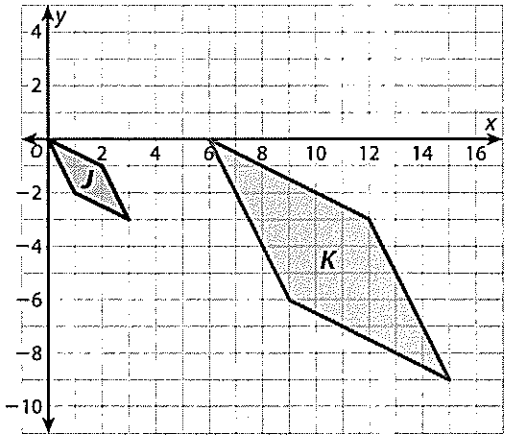
2



3

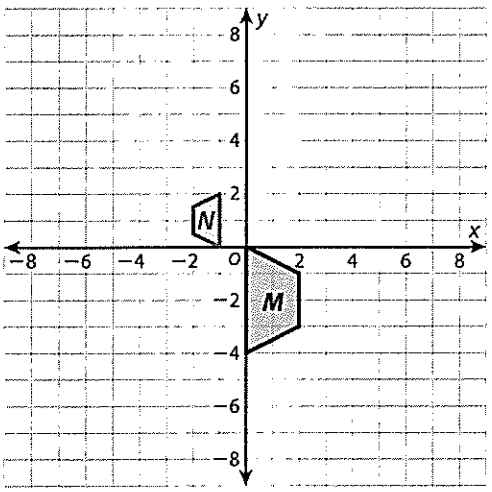


4

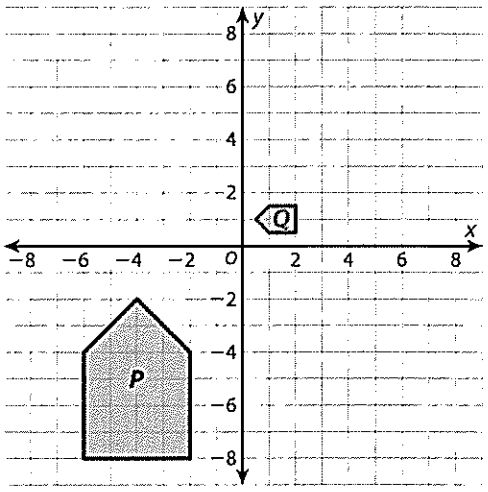


Describing Sequences of Transformations Involving Dilations *continued*

5



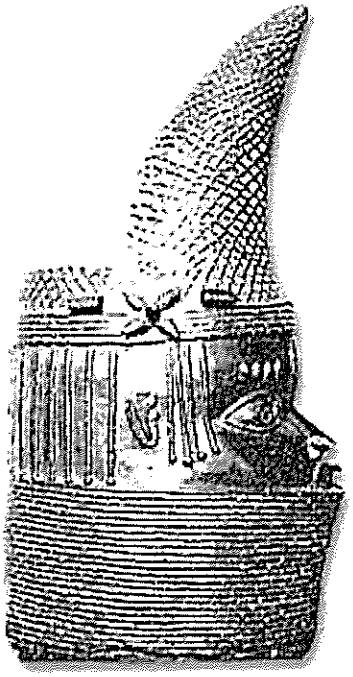
6



7 Give an example of a sequence of transformations that can be performed in any order and will result in the same image.

8 Give an example of a sequence of transformations for which changing the order results in a different final image.

6a. West African Society at the Point of European Contact



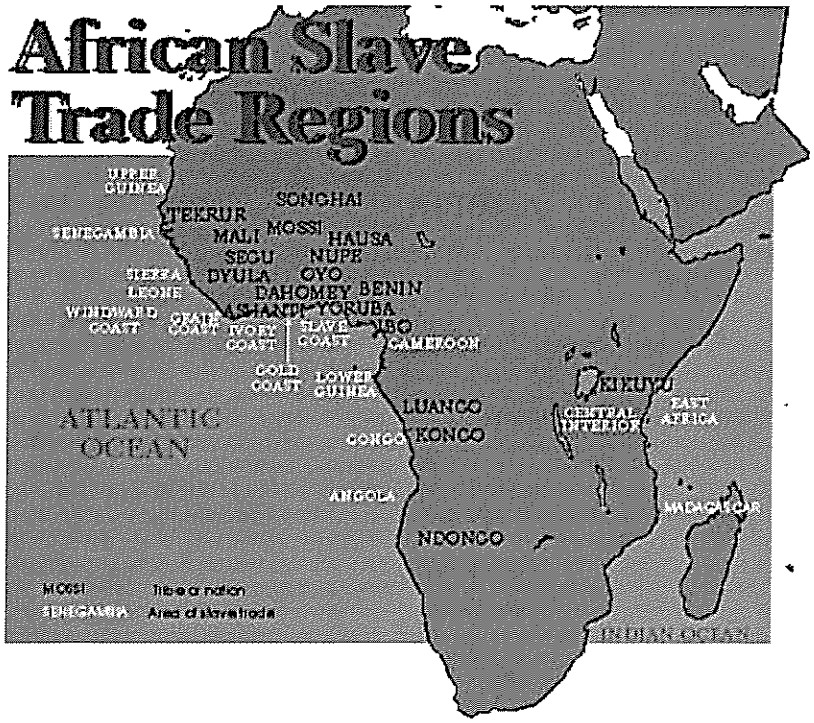
Art, such as this bronze head from Benin, is used to recount the history of the kingdom and its rulers.

Powerful **KINGDOMS**, beautiful sculpture, complex trade, tremendous wealth, centers for advanced learning — all are hallmarks of **AFRICAN CIVILIZATION** on the eve of the age of exploration.

Hardly living up to the "**DARK CONTINENT**" label given by European adventurers, Africa's cultural heritage runs deep. The empires of **GHANA**, **MALI**, and **SONGHAY** are some of the greatest the world has ever known. **TIMBUKTU**, arguably the world's oldest university, was the intellectual center of its age.

Although primarily agricultural, West Africans held many occupations. Some were hunters and fishers. Merchants traded with other African communities, as well as with Europeans and Arabs. Some West Africans mined gold, salt, iron, copper or even diamonds. African art was primarily religious, and each community had artisans skilled at producing works that would please the tribal gods.

The center of African life in ancient and modern times is the family. Since Africans consider all individuals who can trace roots to a common **ANCESTOR**, this family often comprised hundreds of members.



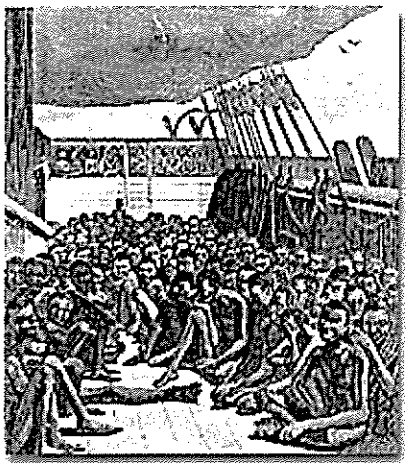
The slave trade that brought millions of men and women to North America unwillingly, also affected many areas of Africa. This map shows some of the regions involved in the African slave trade.

Like Native American tribes, there is tremendous diversity among the peoples of West Africa. Some traced their heritage through the father's **BLOODLINE**, some through the mothers. Some were democratic, while others had a strong ruler. Most African tribes had a noble class, and slavery in Africa predates the written record.

The slavery known to Africans prior to European contact did not involve a belief in inferiority of the slaves. Most slaves in West Africa were captured in war. Although legally considered property, most African slaves were treated as family members. Their children could not be bought or sold. Many achieved high honors in their communities, and freedom by manumission was not uncommon. Plantation slavery was virtually unknown on the African continent.

The impending slave trade brings ruin to West Africa. Entire villages disappear. Guns and alcohol spread across the continent. Tribes turn against other tribes as the once-fabled empires fade into history. The **DIASPORA OF AFRICAN PEOPLES** around the world had begun.

6b. "The Middle Passage"



This illustration depicts what one reporter saw on the upper deck of a slave ship — "about four hundred and fifty native Africans, in a sitting or squatting posture, the most of them having their knees elevated so as to form a resting place for their heads and arms."

Two by two the men and women were forced beneath deck into the bowels of the slave ship.

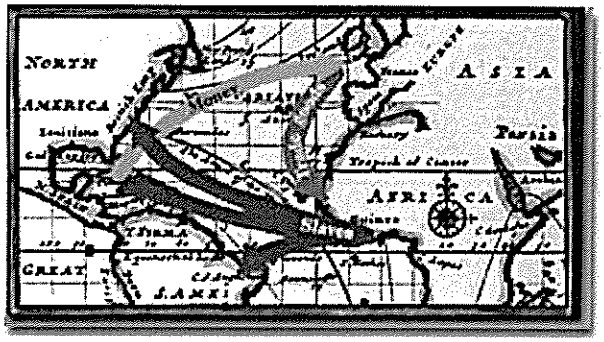
The "packing" was done as efficiently as possible. The captives lay down on unfinished planking with virtually no room to move or breathe. Elbows and wrists will be scraped to the bone by the motion of the rough seas.

Some will die of disease, some of starvation, and some simply of despair. This was the fate of millions of West Africans across three and a half centuries of the slave trade on the voyage known as the "middle passage."

Two philosophies dominated the loading of a slave ship. "**LOOSE PACKING**" provided for fewer slaves per ship in the hopes that a greater percentage of the cargo would arrive alive. "**TIGHT PACKING**" captains believed that more slaves, despite higher casualties, would yield a greater profit at the trading block.

Doctors would inspect the slaves before purchase from the African trader to determine which individuals would most likely survive the voyage. In return, the traders would receive guns, gunpowder, rum or other sprits, textiles or trinkets.

The "**MIDDLE PASSAGE**," which brought the slaves from West Africa to the West Indies, might take three weeks. Unfavorable weather conditions could make the trip much longer.



The Transatlantic (Triangular) Trade involved many continents, a lot of money, some cargo and sugar, and millions of African slaves.

Slaves were fed twice daily and some captains made vain attempts to clean the hold at this time. Air holes were cut into the deck to allow the slaves breathing air, but these were closed in stormy conditions. The bodies of the dead were simply thrust overboard. And yes, there were uprisings.

Upon reaching the West Indies, the slaves were fed and cleaned in the hopes of bringing a high price on the block. Those that could not be sold were left for dead. The slaves were then transported to their final destination. It was in this unspeakable manner that between ten and twenty million Africans were introduced to the New World.

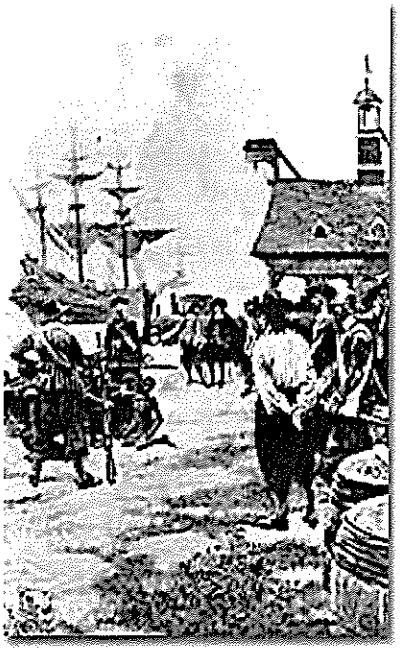
6c. The Growth of Slavery

Howard Pyle

The Dutch colony of New Amsterdam, now New York, received its first large shipment of slaves directly from Africa in 1655.

Africans were the immigrants to the British New World that had no choice in their destinations or destinies. The first African Americans that arrived in Jamestown in 1619 on a Dutch trading ship were not slaves, nor were they free. They served time as indentured servants until their obligations were complete. Although these lucky individuals lived out the remainder of their lives as free men, the passing decades would make this a rarity. Despite the complete lack of a slave tradition in mother England, slavery gradually replaced indentured servitude as the chief means for plantation labor in the Old South.

Virginia would become the first British colony to legally establish slavery in 1661. Maryland and the Carolinas were soon to follow. The only Southern colony to resist the onset of slavery was Georgia, created as an Enlightened experiment. Seventeen years after its formation, Georgia too succumbed to the pressures of its own citizens and repealed the ban on African slavery. Laws soon passed in these areas that condemned all children of African slaves to lifetimes in chains.



Howard Pyle

The first African Americans in the New World arrived at Jamestown on a Dutch ship in 1619.

No northern or middle colony was without its slaves. From Puritan Massachusetts to Quaker Pennsylvania, Africans lived in **BONDAGE**. Economics and geography did not promote the need for slave importation like the plantation South. Consequently, the slave population remained small compared to their southern neighbors. While laws throughout the region recognized the existence of slavery, it was far less systematized. Slaves were more frequently granted their freedom, and opposition to the institution was more common, especially in Pennsylvania.

As British colonists became convinced that Africans best served their demand for labor, importation increased. By the turn of the eighteenth century **AFRICAN SLAVES** numbered in the tens of thousands in the British colonies. Before the first shots are fired at Lexington and Concord, they totaled in the hundreds of thousands. The cries for liberty by the colonial leaders that were to follow turned out to be merely white cries.

6e. Free African Americans in the Colonial Era

Library of Congress

Benjamin Banneker, a free black born in Maryland, 1731, was an almanac publisher

When **CRISPUS ATTUCKS** earned his unfortunate claim to fame as a victim in the Boston Massacre, he was not a slave. He was one of the relatively few African Americans to achieve freedom in colonial America. Although freedom is clearly desirable in comparison to a life in chains, free African Americans were unfortunately rarely treated with the same respect of their white counterparts.

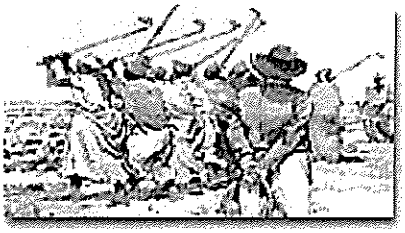
There were several ways African Americans could achieve their freedom. Indentured servants could fulfill the terms of their contracts like those brought to Jamestown in 1619. In the early days, when property ownership was permitted, skilled slaves could earn enough money to purchase their freedom. Crispus Attucks and many others achieved liberty the hard way — through a daring escape. It only stands to reason that when faced with a perpetual sentence of bondage many slaves would take the opportunity to free themselves, despite the great risks involved.

Another way of becoming free was called **MANUMISSION** — the voluntary freeing of a slave by the master. Masters did occasionally free their own slaves. Perhaps it was a reward for good deeds or hard work. At times it was the work of a guilty conscience as masters sometimes freed their slaves in their wills. Children spawned by slaves and masters were more likely to receive this treatment. These acts of kindness were not completely unseen in colonial America, but they were rare. In the spirit of the Revolution, manumission did increase, but its application was not epidemic.

Free African Americans were likely to live in urban centers. The chance for developing ties to others that were free plus greater economic opportunities made town living sensible. Unfortunately, this "freedom" was rather limited. Free African Americans were rarely accepted into white society. Some states applied their slave codes to free African Americans as well. Perhaps the most horrifying prospect was **KIDNAPPING**. Slave catchers would sometimes abduct free African Americans and force them back into slavery. In a society that does not permit black testimony against whites, there was very little that could be done to stop this wretched practice.

6d. Slave Life on the Farm and in the Town

In the first decades of European settlement in America, the physical labor of establishing homes, agriculture, and commerce was carried out by "bound" laborers—that is unpaid workers who were owned by ("bound" to) a "master" who controlled not only their labor, but also all other aspects of their lives. These workers were "indentured servants" from Europe, who were freed after some years of service, or indigenous native Americans (who often knew how to escape into areas where European "masters" could not find them), or by laborers bought in Africa and stranded in America, unable to return to their homes, and easily identifiable by their dark skins. Sometimes African workers were treated like indentured servants, and freed after some years of service. But after 1690, the status of slavery hardened: bound labor, based on race, became a lifetime sentence, inherited from generation to generation.

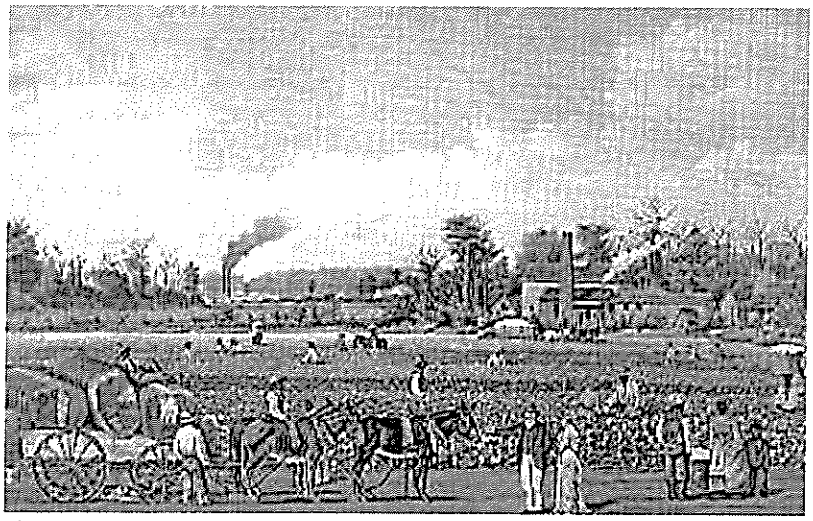


Enslaved people on Southern plantations worked a variety of tasks and performed many kinds of labor.

What was it like to live in bondage? The experiences of enslaved people varied somewhat, depending upon region and the local economy. Sometimes, the type of life an enslaved person could expect depended on whether they lived on farms or in towns—and on the temperament or mood of their masters.

Often, the first image that comes to mind when considering slavery is the image of the large plantation, where the cultivation of the planter's crop was the first priority. Beyond these duties, enslaved people's skills might be used to clear land, design and construct houses or fences, to breed and tend livestock, to create and tend gardens, craft medicines from local plants, or other jobs as particular circumstances might dictate. White overseers might be assigned to monitor the work. Overseers had less economic investment in the slave, and the enslaved people often bore the brunt of an overseer's resentment of the master's wealth, power, and privilege. Sometimes an enslaved person, called a "driver," would be enticed into holding this position. Not surprisingly, both overseers and drivers were often disliked by the people they controlled. On large plantations, enslaved people's living quarters were often set at some distance from the master's house. These "slave quarters" as they were called, were small and spartan, and—unless the residents kept their own gardens or made their own clothing—food and clothing were often sparse and of low quality.

Large plantations might also have a few enslaved people living and/or working inside the masters' houses. These domestic servants might prepare the master's meals, repair or tend the house, make or repair clothing, prepare for guests, and often care for the masters' children. Though in some cases these "house slaves" were considered part of the extended family, they could not forget that they were property, with no protection from being mistreated, beaten, or sold.



This painting shows enslaved people picking cotton on a Mississippi plantation. Youngsters would begin carrying water at the age of 5 or 6.

However, at the height of the slave era (1830–1860), only a few thousand masters owned as many as 300 people. Most rural enslaved people were owned by masters who had 10–20 enslaved people, who often were housed in closer proximity to masters, perhaps sharing housing, and perhaps having access to closer relations with their masters than plantation slaves had. Sometimes—but not always—this housing arrangement could lead to kinder treatment. Sometimes, too, this closeness could open opportunities for black laborers to purchase their own freedom, or the freedom of their wives—a great advantage, since a child born to a free mother was automatically free.

Some urban merchants and artisans employed slave labor in their shops. This enabled enslaved people to ply the craft skills they brought with them, as well as to acquire skills that were marketable in their new environment. In that setting, however, enslaved workers sometimes encountered the resentment of white craftsmen who felt displaced. Generally, enslaved people who lived in towns had greater freedom than those who lived on farms. They could become more aware of opportunities for escape, and they could form a more diverse community with other people of African descent who were enslaved or who were free. Daring (or desperate) individuals—in both rural and urban settings—sometimes used such connections to seize the opportunity for escape.

6f. "Slave Codes"

The Granger Collection, New York

Nat Turner was inspired by visions of the Spirit to lead a slave uprising in Virginia on August 22, 1831.

Slaves did not accept their fate without protest. Many instances of **REBELLION** were known to Americans, even in colonial times. These rebellions were not confined to the South. In fact, one of the earliest examples of a slave **UPRISING** was in 1712 in Manhattan. As African Americans in the colonies grew greater and greater in number, there was a justifiable paranoia on the part of the

white settlers that a violent rebellion could occur in one's own neighborhood. It was this fear of rebellion that led each colony to pass a series of laws restricting slaves' behaviors. The laws were known as **SLAVE CODES**.

Although each colony had differing ideas about the rights of slaves, there were some common threads in slave codes across areas where slavery was common. Legally considered property, slaves were not allowed to own property of their own. They were not allowed to assemble without the presence of a white person. Slaves that lived off the plantation were subject to special curfews.

In the courts, a slave accused of any crime against a white person was doomed. No testimony could be made by a slave against a white person. Therefore, the slave's side of the story could never be told in a court of law. Of course, slaves were conspicuously absent from juries as well.

Slave codes had ruinous effects on African American society. It was illegal to teach a slave to read or write. Religious motives sometimes prevailed, however, as many devout white Christians educated slaves to enable the reading of the Bible. These same Christians did not recognize marriage between slaves in their laws. This made it easier to justify the breakup of families by selling one if its members to another owner.

As time passed and the numbers of African Americans in the New World increased, so did the fears of their white captors. With each new rebellion, the slave codes became ever more strict, further abridging the already limited rights and privileges this oppressed people might hope to enjoy.

6g. A New African-American Culture

Kwanzaa is an African American and Pan-African holiday which celebrates the best of African history, thought, and culture.

When immigrants reach a new land, their old ways die hard. This has been the case with most immigrant groups to the New World. The language, customs, values, religious beliefs, and artistic forms they bring across the Atlantic are reshaped by the new realities of America and, in turn, add to its fabric. The rich traditions of Africa combined with the British colonial experience created a new ethnicity — the African American.

Much controversy arises when attempts are made to determine what African traditions have survived in the New World. Hundreds of words, such as "**BANJO**" and "**OKRA**" are part of American discourse. Africans exercised their tastes over cuisine whenever possible. Song and dance traditions comparable to African custom were commonly seen in the American South. **FOLK ARTS** such as basket weaving followed the African model. Even marriage patterns tended to mirror those established overseas.

Phillis Wheatly's poetry reflected the slavery experience on the cusp of the American Revolution.

Much of African history is known through **ORAL TRADITION**. Folk tales passed down through the generations on the African continent were similarly dispatched in African American communities. Some did learn the written word. Poet and slave **PHILLIS WHEATLEY** is still studied. Her writings vividly depict the slave experience on the eve of the American Revolution.

Many devout British colonists saw **CONVERSION** of slaves to Christianity as a divine duty. Consequently, the Christian religion was widely adopted by slaves. The practice of Christianity by slaves differed from white Christians. Musical traditions drew from rhythmic African and melodic European models. The religious beliefs of many African tribes merged with elements of Christianity to form **VOODOO**. Spirituals also demonstrate this merger.

Despite laws regulating slave literacy, African Americans learned many elements of the English language out of sheer necessity. Since the planters' children were often raised by slaves, their dialects, values and customs were often transmitted back. This reflexive relationship is typical of cultural fusion throughout American history.

CLOSE READING INSTRUCTIONS

1. **Close Read:** Read with a pencil/highlighter in hand, and annotate the text.
   - Annotating *means* underlining or highlighting key words and phrases—anything that strikes you as surprising or important, or that raises questions.
   - Annotating *includes* writing your thoughts and reactions in the margins next to what you have highlighted or underlined. These need to be rich comments. Rich comments might begin with the word, what or why or any of the phrases that could also be used to start your reflection statement.
   - Highlight or circle words you don't know, and look them up! Write down the definition in the margin next to the word.
   - I am looking for 6-8 annotations per page of the article.

2. **Summary Statement:** Write a summary statement for the article in which you include:
   - The author, title, and source
   - The sentence completed with the main idea of the article
   - The summary statement is 25 words or less; the author/title/source counts as **1** word.
   - At the end of your statement, write the number of words in your statement and circle it.

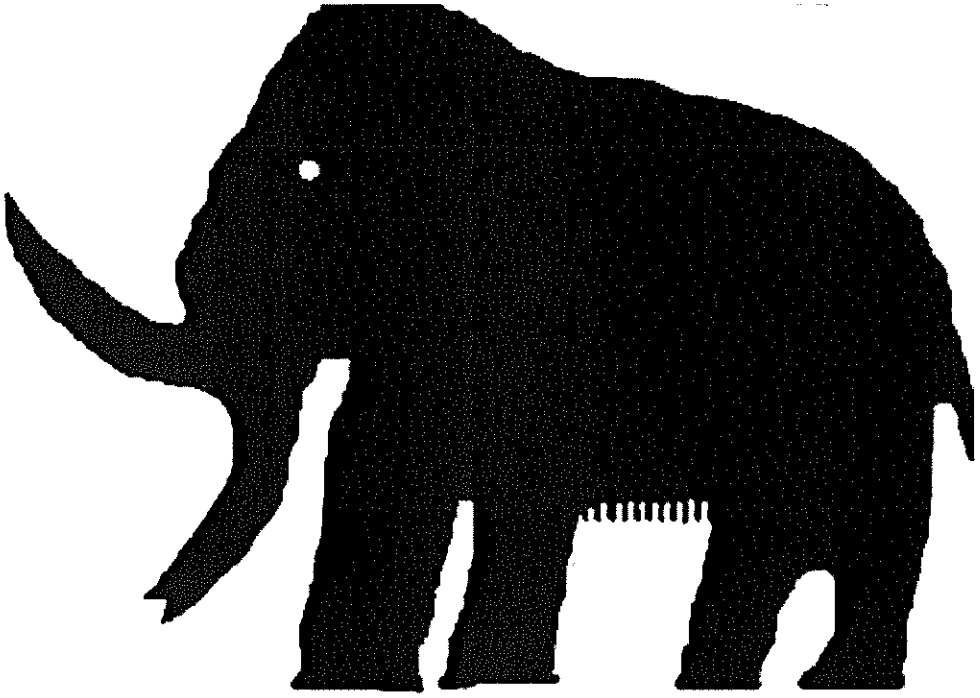
3. **Reflection Statement:** Use one of the following sentence starters and write a brief 1-2 sentence reflection statement for the article.

A.	I noticed. . .	E) I'd like to know. . .
B.	I wonder. . .	F) I realized. . .
C.	I was reminded of. . .	G) If I were. . .
D.	I am surprised that. . .	H) I am not sure. . .

Day 1

The Woolly Mammoth

by Edward I. Maxwell



The closest relative of the woolly mammoth is the Asian elephant. The main difference between the two is that the mammoth had an incredible coat of fur, made up of an outer layer of coarse "guard hair" with an inner layer of curly wool. The last known group of mammoths died off, or became extinct, around 4,000 years ago. The mammoth roamed the northern lands of the world during a period known as the Ice Age. It was among the largest land mammals to roam the earth. The mammoth was a tough beast and was able to endure extreme weather conditions and frigid temperatures.

The mammoth shared these northern territories with other mammals during the Ice Age. The most important mammal to interact with the mammoth, however, was the human. When the mammoths were at their greatest numbers, humans mainly hunted animals and foraged for food. These hunters would follow herds of animals over incredibly long distances in order to hunt them. The woolly mammoth provided a great amount of food and other important things for these humans. The fur, for example, could be used to make coats and blankets that would help keep out the cold in the icy environment. Bones from the mammoth could be used to make tools and weapons. Because one mammoth provided so many useful things to a large group of people, early humans would follow the herds wherever they went. There is even a theory that the humans followed the mammoth over a land-bridge from Asia into the Americas.

How do we know that the mammoth existed? Scientists have found countless mammoth fossils, or bones, all over the world. In fact, scientists have even found very well-preserved, or mummified, mammoth bodies in sheets of ice. These mummified remains are part of the reason scientists came to know exactly how hairy and woolly the mammoths actually were. Another reason scientists know so much about mammoths is that early humans painted pictures of them on cave walls. These pictures depicted hunting parties chasing after mammoth herds and trying to bring down the great beasts with spears.

Certain features of the woolly mammoth allowed it to survive very well in this harsh environment. The most obvious feature was, of course, its hair and wool. This coat helped the mammoth maintain a warm and stable body temperature no matter how cold the landscape became. The coarse hair would keep ice and frost from collecting too close to the mammoth's body, which left the softer, wool inner-layer free to keep the animal extra warm. Another feature was the mammoth's large tusks. These tusks were very long and curved out wide from the mammoth's head. It was able to use these tusks for protection. Besides humans, there were other predators the mammoth had to face. The American lion was an incredibly large predatory cat. The mammoth's tusks could be swung into an attacking lion to keep the predator away or even injure it. Mammoths driven to stand and fight or protect their young might even have charged humans with their large tusks, looking to make a crushing blow.

Humans were very smart hunters, however. Hunting in large parties, the humans would most likely isolate a mammoth from its herd, and attack it all at once in great numbers. Wielding their spears expertly, the humans would bring the mammoth down as quickly as possible, and then set about butchering it with stone scraping tools, axes and knives. It is believed that the success of human hunters was a large part of why the mammoth became extinct. Another reason had to do with the climate. The Ice Age did not last forever. The earth's temperature rose again. The glacial ice receded, and many scientists believe the mammoth was not well suited for the warmer weather. The environment that had once been so hospitable to a great animal very well-adapted to the frigid conditions gradually became more hostile. Finally, the last group of mammoths died off 4,000 years ago. Now all that remain of the mammoth are fossilized bones and mummified mammoth bodies that were frozen over a long time ago.

Name: _____ **Date:** _____

1. What is the woolly mammoth?

A. a picture painted on cave walls by early humans

B. a land-bridge that humans may have followed from Asia into the Americas

C. a large land mammal that died off around 4,000 years ago

D. a large predatory cat that lived in the Americas during the Ice Age

2. What does this passage describe?

A. This passage describes the spears that early humans used.

B. This passage describes what happened to the American lion when the Ice Age ended.

C. This passage describes the Asian elephant.

D. This passage describes woolly mammoths.

3. Woolly mammoths had features that helped them live in a harsh environment.

What evidence from the passage supports this statement?

A. The hair on the coat of woolly mammoths kept ice from collecting too close to their bodies.

B. The last known group of woolly mammoths died off around 4,000 years ago.

C. Pictures on cave walls show hunting parties chasing after herds of woolly mammoths.

D. All that now remains of woolly mammoths are fossilized bones and mummified bodies.

4. What made the environment of woolly mammoths harsh?

A. rising temperatures and Asian elephants

B. cold weather and predators such as humans and lions

C. coats made up of coarse hair and a softer inner-layer

D. a land-bridge that connected Asia with the Americas

5. What is this passage mostly about?

A. the Ice Age, how it began and ended, and its effect on the American lion and early humans

B. the woolly mammoth, how early humans interacted with it, and why it may have died off

C. the possible reasons that woolly mammoths died off around 4,000 years ago

D. the mammoth fossils that scientists have found and what scientists have learned from those fossils

6. Read the following sentence: "The fur, for example, could be used to make coats and blankets that would help keep out the cold in the icy **environment**."

What does the word **environment** mean?

A. the study of animal bones and mummified bodies

B. a cave in which people have painted pictures of woolly mammoths

C. a coat with coarse hair on the outside and curly wool on the inside

D. the place and conditions in which someone or something lives

7. Choose the answer that best completes the sentence below.

Humans continued to live after the Ice Age; _____, woolly mammoths did not.

A. as an illustration

B. in particular

C. however

D. third

8. Describe the tusks of the woolly mammoth.

_____

_____

_____

9. How might the woolly mammoth have used its tusks for protection?

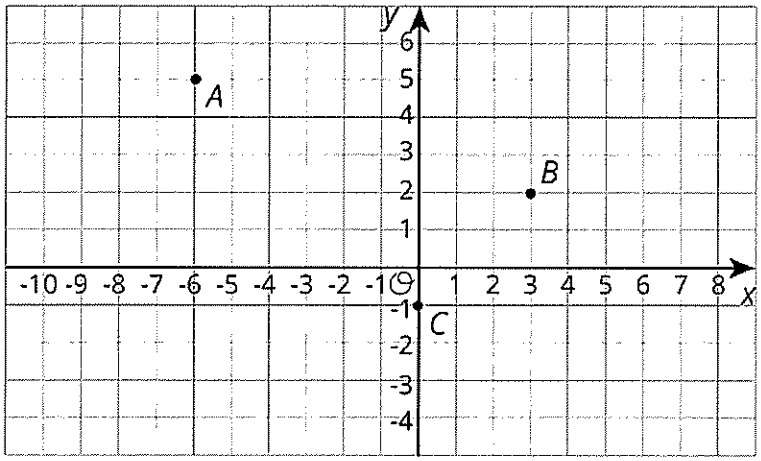
10. The passage describes the woolly mammoth as a "tough beast." What made it tough? Explain your answer using evidence from the passage.

NAME DATE PERIOD

Unit 1, Lesson 5

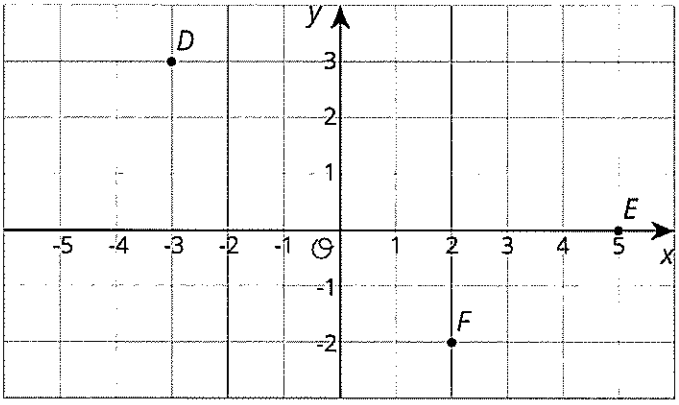
Practice Problems

1. a. Here are some points.



What are the coordinates of A, B, and C after a translation to the right by 4 units and up 1 unit? Plot these points on the grid, and label them A', B' and C'.

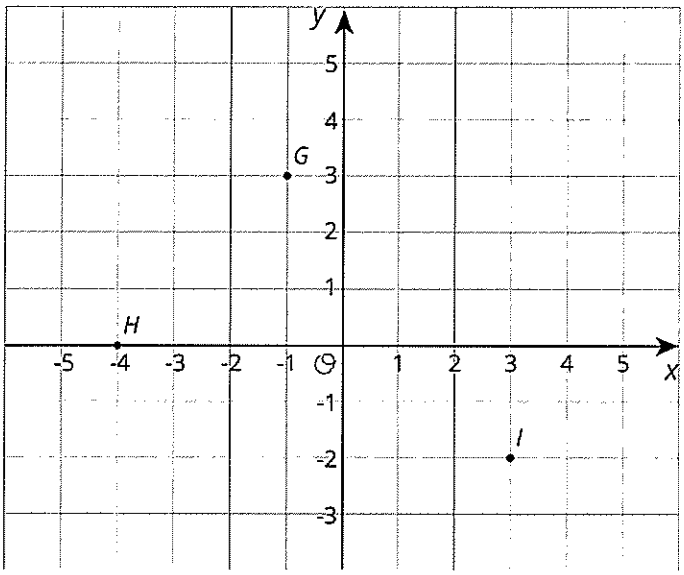
b. Here are some points.



What are the coordinates of D, E, and F after a reflection over the y axis? Plot these points on the grid, and label them D', E' and F'.

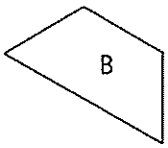
c. Here are some points.

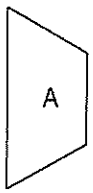
NAME DATE PERIOD



What are the coordinates of G, H, and I after a rotation about $(0, 0)$ by 90 degrees clockwise? Plot these points on the grid, and label them G', H' and I'.

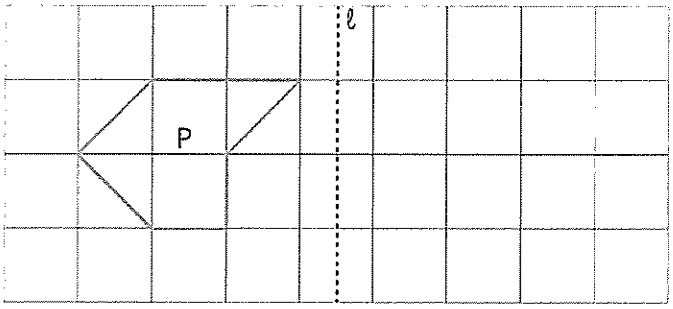
2. Describe a sequence of transformations that takes trapezoid A to trapezoid B.





3. Reflect polygon P using line ℓ.

NAME DATE PERIOD



History Lab: How Should George Washington Be Judged On The Issue of Slavery?

- **A man uncomfortable with slavery, but committed to keeping all 13 original states together in one union.**

or

- **A willing participant in the institution of slavery that should have done more to help abolish the practice.**

Background Information:

George Washington and Slavery Background - Maryland Department of Education

George Washington lived during a time when slavery was an "accepted" practice for most Americans. His father's death made him an owner of 10 slaves when he was only 11 years old. Like most people of the Virginia gentry, he believed that the only way to be successful was to own land.

Owning that land, however, was not enough. That land had to be cultivated and made useful. In order to do that, Washington and his peers turned to enslaved Africans for their labor force. Washington possessed approximately 75 slaves between 1743 and 1775. Some he inherited from his father; his 1759 marriage to Martha Custis provided him with access to 25 more. He used their labor to establish successful farming operations at Mount Vernon and his other farms. By the time of his death, his estate included 317 enslaved people, 124 of whom were his property outright, 153 who were Martha Washington's dower slaves, and 40 whom he had leased from a neighbor. Washington's landholdings were vast. In addition to Mount Vernon, he owned and operated four additional farms. Since each farm was a separate entity, the slave labor force on each had to be diversified in order to make the operations successful. Because 132 of his 317 enslaved laborers were either too old or too young to work, Washington's five farms were actually staffed by only 184 people. Of those 184, 52 were considered skilled artisans or domestic workers. The work of skilled artisans such as coopers, blacksmiths, bricklayers, carpenters, and distillers were essential to the everyday operation of plantations. Domestic workers included butlers, maids, cooks, and waiters. Most of Washington's enslaved population, however, were field workers.

Like many of the Founding Fathers, Washington had conflicting feelings over the institution of slavery. Despite never having made a public stand on the issue during his lifetime, he left behind a will that served as an example of his changed beliefs. In his 1799 will, he made provisions for the emancipation of all of his slaves. Washington gave immediate freedom to his body servant, Billy Lee. He was one of Washington's close and loyal personal servants. The remaining slaves were to be emancipated after his wife's death.

Source: http://marylandpublicschools.org/NR/rdonlyres/F68E8866-61CB-4AF5-8AE6-F9275A9CEE9C/31536/Washington_Changing_Views_Emancipation_02062012_.pdf

Source 1: *Advertisement for Runaway Slaves Printed in Maryland Gazette (Annapolis), 20 August 1761 by George Washington*

Ran away from a Plantation of the Subscriber's, on *Dogue Run* in *Fairfax,* on Sunday the 9th Instant, the following Negroes, [1] *viz.*

Peros, 35 or 40 Years of Age, a well-set Fellow, of about 5 Feet 8 Inches high, yellowish Complexion, with a very full round Face, and full black Beard, his Speech is something slow and broken, but not in so great a Degree as to render him remarkable. He had on when he went away, a dark colour'd Cloth Coat, a white Linen Waistcoat, white Breeches and white Stockings. [2]

Jack, 30 Years (or thereabouts) old, a slim, black, well made Fellow, of near 6 Feet high, a small Face, with Cuts down each Cheek, being his Country Marks, his Feet are large (or long) for he requires a great Shoe: The Cloathing he went off in cannot be well ascertained, but it is thought in his common working Dress, such as Cotton Waistcoat (of which he had a new One) and Breeches, and Osnabrig Shirt. [3]

Neptune, aged 25 or 30, well set, and of about 5 Feet 8 or 9 Inches high, thin jaw'd, his Teeth stragling and fil'd sharp, his Back, if rightly remember'd, has many small Marks or Dots running from both Shoulders down to his Waistband, and his Head was close shaved: Had on a Cotton Waistcoat, black or dark colour'd Breeches, and an Osnabrig Shirt. [4] …

The two last of these Negroes were bought from an *African* Ship in *August* 1759, [6] and talk very broken and unintelligible *English;* the second one, *Jack,* is Countryman to those, and speaks pretty good *English,* having been several Years in the Country. The other, *Peros,* speaks much better than either, indeed has little of his Country Dialect left, and is esteemed a sensible judicious Negro.

As they went off without the least Suspicion, Provocation, or Difference with any Body, or the least angry Word or Abuse from their Overseers, [7] 'tis supposed they will hardly lurk about in the Neighbourhood, but steer some direct Course (which cannot even be guessed at) in Hopes of an Escape: Or, perhaps, as the Negro *Peros* has lived many Years about *Williamsburg,* and *King William County,* and *Jack* in *Middlesex,* they may possibly bend their Course to one of those Places.

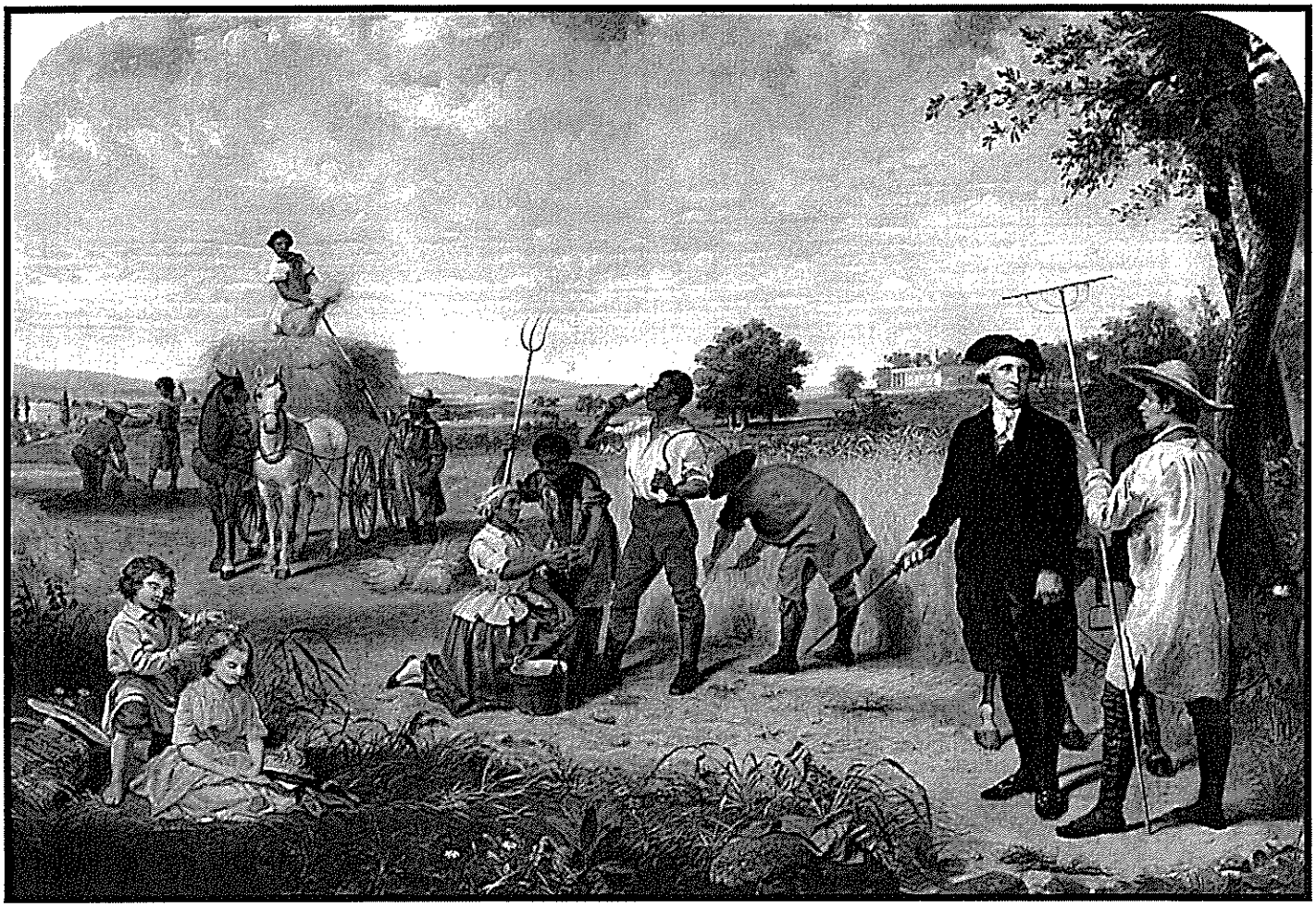
Whoever apprehends the said Negroes, so that the Subscriber may readily get them, shall have, if taken up in this County, Forty Shillings Reward, beside what the Law allows; and if at any greater Distance, or out of the Colony, a proportionable Recompence paid them, by

George Washington.

N.B. If they should be taken separately, the Reward will be proportioned.

Source: 2 "Farmer at Mount Vernon" painted by *James Brutus Stearns*

James Brutus Stearns is best known for his five part "Washington Series," 1847-1856, in which he chronicles George Washington's life as farmer at his plantation; citizen at his wedding; soldier at Monongahela; Christian on his deathbed, and statesman at the Founding. This particular painting was completed in 1851 and resides in the Virginia Museum of Fine Arts.



Source 3: A slave family standing next to baskets of recently-picked cotton near Savannah, Georgia in the 1860s.

Source: 4 Three-minute lecture from conservative historian Burt Folsom (Hillsdale College) on George Washington's stance and actions on the issue of slavery. Filmed on June 15, 2011. https://www.youtube.com/watch?v=KAU-0IGiPq4

Source 5: Two Letters from George Washington

Letter to Robert Morris – April 12, 1786

Background - In 1786, George Washington wrote on behalf of a fellow Virginia slave holder to Robert Morris, a wealthy Philadelphian. Morris was a signer of the Declaration of Independence, served as superintendent of finance for the Continental Congress, and later founded the Bank of America.

"I hope it will not be conceived from these observations, that it is my wish to hold the unhappy people, who are the subject of this letter, in slavery. I can only say that there is not a man living who wishes more sincerely than I do, to see a plan adopted for the abolition of it; but there is only one proper and effectual mode by which it can be accomplished and that is by Legislative authority; and this, as far as my suffrage will go, shall never be wanting. But when slaves who are happy and contented with their present masters, are tampered with and seduced to leave; when a conduct of this sort begets discontent on one side and resentment on the other, and when it happens to fall on a man, whose purse will not measure with that of the Society, he looses [sic] his property for want of means to defend it; it is oppression in the latter case, and not humanity in any, because it introduces more evils than it can cure."

Letter from George Washington to John Francis Mercer – September 9,1786

Mercer served in the Revolutionary War and was a member of Continental Congress. He attended the Constitutional Convention, served in various state political posts (for Virginia and then Maryland), and was Governor of Maryland 1801-1803.

"With respect to the first. I never mean (unless some particular circumstances should compel me to it) to possess another slave by purchase; it being among my first wishes to see some plan adopted by, [the Legislature] which slavery in this Country may be abolished by slow, sure, & imperceptible [gradual] degrees."

Source 6: *Letter from George Washington to his personal secretary Tobias Lear. Within this letter, he talks about a plan to get around the Pennsylvania state law that frees any slave that has been in the state for 6 consecutive months.*

[Letter below is paraphrased) Actual Letter: http://founders.archives.gov/documents/Washington/05-08-02-0062

April 12, 1791

Mr. Lear,

I would like to discuss with you the situation regarding my slaves and the Pennsylvania state law known as the Gradual Abolition Act. According to this law, any slave staying six consecutive months in the state of Pennsylvania is supposed to be set free. As you know, I am planning on taking a handful of my slaves with me to Philadelphia (acting capital) and I do not want to lose their services. Besides, I doubt that complete freedom would do them much good, but there will be a small amount of citizens in Philadelphia that might try and entice them to run away to seek emancipation.

In order to get around this law, I think I have devised a successful plan. I will have my wife Martha Washington transport slaves back and forth between Virginia and Philadelphia before any of my slaves have six consecutive months in Pennsylvania. Again, I think this can work and at the same time avoid public scrutiny.

Please keep this plan just between you, me, and Ms. Washington.

Sincerely,

George Washington

Primary Source Analysis Sheet

Source or Text	When was this source created? What was the creator of this source trying to communicate?	What information does this source provide?	Does this source make George Washington look moral or immoral on the issue of slavery?
Source 1: *Advertisement for Runaway Slaves*			
Source 2: *"Farmer at Mount Vernon" Painting*			
Source 3: *Image of slaves in field*			
Source 4: *Three-minute lecture from conservative historian Burt Folsom*			

Source or Text	When was this source created? What was the creator of this source trying to communicate?	What information does this source provide?	Does this source make George Washington look moral or immoral on the issue of slavery?
Source 5 *Two Letters from George Washington*			
Source 6 *Letter from George Washington to his personal secretary Tobias Lear*			

COMMONLIT

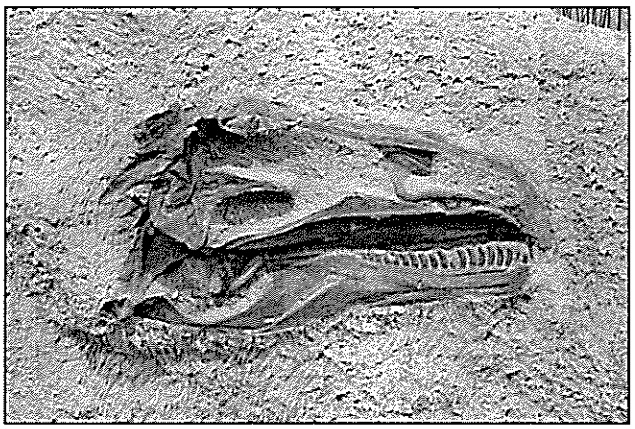
Name: _____ Class: _____

Clues to Ancient Life

By Rona Arato
2004

Fossils are the remains or impressions of organisms from long ago. In this informational text, Rona Arato discusses how different types of fossils are formed and why it's important to study them. As you read, take notes on the different types of fossils, how they're formed, and why they are important.

[1] Fossils provide a record of life on Earth. Fossils reveal evidence of ancient life that is preserved in sediment or sedimentary rock. Fossils range from tiny plants and animals to the bones of enormous dinosaurs.



"Camarasaurus" by daveynin is licensed under CC BY 2.0.

Why study fossils?

Scientists learn about past life on Earth and how Earth has changed over millions of years from fossils. Fossils tell what animals and plants lived and died out at different times. By examining fossils and the rocks they are found in, scientists understand the effects that events such as mass extinctions,[1] meteorite[2] impacts, and climate change have on Earth's history. Fossils provide a valuable look into our past, but they do not tell the whole story. Many plants and animals did not become fossils.

Body Fossils

Body fossils are the whole body or parts of the body of a plant or animal. To become a body fossil, some part of the organism must not decay or rot. Skin and internal organs rot, but bones do not. Plant material rots, so plants occur only as imprint fossils. Most body fossils are found buried in sediment, or layers of rock and soil. In rare cases, extreme cold freezes an organism, similar to the way a freezer preserves food. In very dry conditions, such as deserts, a dead animal loses its moisture and shrivels up.

Trace fossils

Trace fossils are markings left behind by an organism such as footprints, trails, burrows, and nests. Scientists learn about the movement and behavior of animals from trace fossils. Coprolites are fossilized animal waste. Paleontologists[3] learn what an animal ate from its coprolite.

1. **Extinction** *(noun):* the state or process of an entire species dying out
2. a mass of stone or metal that has reached the earth from outer space
3. a scientist who studies fossils

Sea fossils

[5] Over 2,000 years ago, Greek scientists found fossils of sea life in the Pindus Mountain range, in Greece. They said the fossils proved that the mountains had at one time been under the sea. Most people refused to believe them. Today, scientists know that oceans at one time covered most of Earth then receded,[4] leaving behind dry land. Life began in the sea and has existed about eight times longer than life on land. Many more sea animals than land animals have been preserved.

How fossils form

Earth's crust is made up of different types of rock. Fossils are found in rock. There are three forms of rock: igneous, sedimentary, and metamorphic. Rocks are made up of different kinds of minerals. Minerals are solid, non-living substances made of elements.

Sedimentary rock

Most fossils are found in sedimentary rock. The word sediment means "something that settles." Sedimentary rocks are a mixture of dust, sand, mud, shells, corals, and other materials that settle underwater or on land, and compress under pressure. Sedimentary rock forms in layers called strata, with the oldest layer under the newer layers. When a plant or animal dies, it is covered by layers of sediment and preserved as a fossil. Many sedimentary rocks are fossil-rich, while others contain no fossils.

Making fossils

Few of the billions of organisms that have lived on Earth became fossils. For fossilization to occur, an organism must contain hard parts, such as a skeleton or a shell. It has to be buried deeply right after it dies, before it decays from exposure to air, water, or bacteria.

Igneous rock

Some igneous rocks form when magma[5] rises to the surface through cracks or volcanoes, and cools. Other igneous rocks form when magma crystallizes within Earth's crust. The word igneous means "fiery." Igneous rock does not contain fossils because the lava is so hot it burns any animals and plants it touches.

Metamorphic rock

[10] Metamorphic rocks are rocks that are changed by heat and pressure. The word metamorphic means "change." Most metamorphic rocks are fossil-free because the pressures that changed them destroyed all evidence of fossils. Some rocks, such as slate, may contain traced of fossils, although their shapes are very different than when they were alive.

4. **Recede** *(verb):* to move back or further away from a previous position
5. hot fluid or semifluid material below or within the earth's crust

Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Read the sentence from paragraph 1 of Clues to Ancient Life: "Fossils provide a record of life on Earth." How does the author elaborate on the idea in this sentence? [RI.3]
   A. by describing the different ways that fossils can be formed
   B. by explaining the types of rocks that usually contain fossils
   C. by explaining the information that can be learned from studying fossils
   D. by describing how human understanding of fossils has changed over time

2. PART B: Which sentence form the article best supports the answer to Part A? [RI.1]
   A. "By examining fossils and the rocks they are found in, scientists understand the effects that events such as mass extinctions, meteorite impacts, and climate change have on Earth's history." (Paragraph 2)
   B. "Earth's crust is made up of different types of rock." (Paragraph 6)
   C. "Sedimentary rock forms in layers called strata, with the oldest layer under the newer layers." (Paragraph 7)
   D. "Some rocks, such as slate, may contain traces of fossils, although their shapes are very different than when they were alive." (Paragraph 10)

3. PART A: How does paragraph 6 of "Clues to Ancient Life" help to develop an idea in the article? [RI.5]
   A. It introduces how fossils can be found.
   B. It summarizes where fossils can be found.
   C. It illustrates the process needed for fossils to form.
   D. It explains the conditions that allow fossils to form.

4. PART B: Which paragraph best expands on the idea developed in Part A? [RI.1]
   A. Paragraph 7
   B. Paragraph 8
   C. Paragraph 9
   D. Paragraph 10

Discussion Questions

Directions: Brainstorm your answers to the following questions in the space provided. Be prepared to share your original ideas in a class discussion.

1. What would you do if you found a fossil in your backyard? How would the information in this article inform your discovery?

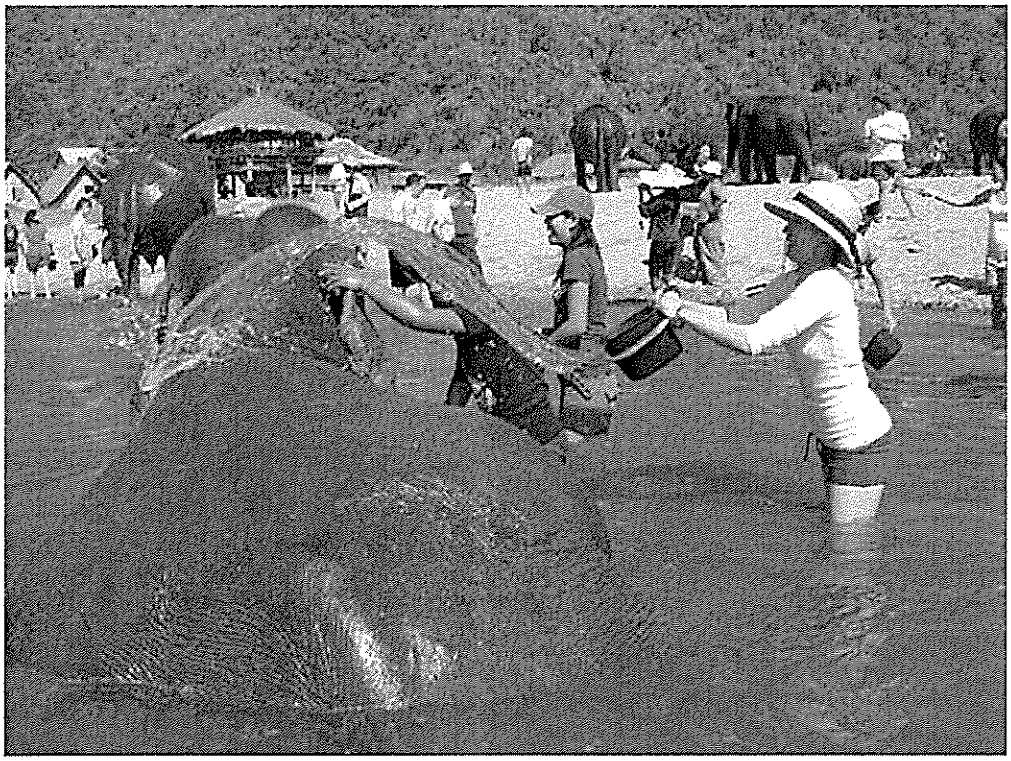
2. In the context of the text, how do fossils help humans understand the world? What type of knowledge do they provide us? Cite evidence from this text, your own experience, and other literature, art, or history in your answer.

3. In the context of the text, how could fossils show us how the world has changed? Cite evidence from this text, your own experience, and other literature, art, or history in your answer.

Day 2

Malai's Mission

by ReadWorks



people helping to keep elephants cool in an elephant sanctuary in Thailand

It was the hottest day of the year. As Malai walked along a side street in the city of Bangkok, Thailand, an old woman walked up to her and smeared a pinkish liquid on her cheek. The woman laughed, then walked away. Malai wiped away the substance with her finger-it was colored talc powder combined with water, a common mixture used during the celebration of Songkran, or the Thai New Year. To mark the occasion, Thais throw water on each other-the streets are filled with people toting water guns and pick-up trucks full of partygoers in the back, dumping water on passersby. People from all over the world come to Thailand to celebrate Songkran. But Malai was tired, and all she wanted to do was to take a break from the water festival.

As she turned the corner, she stumbled upon a baby elephant with a mahout, someone who rides and looks after an elephant. The mahout was jabbing the elephant's ear with a stick, one that had a metal spike at its end. Malai ran up to the mahout and told him to stop; the elephant was clearly being hurt.

"But he misbehaved!" the mahout told Malai, shushing her in the process. "He didn't walk when I told him to."

"He's probably tired," Malai explained. She had seen so many tourists line up to ride elephants in the streets throughout the day, and couldn't imagine working in this heat for so long.

The mahout refused to listen. He gave Malai a dismissive look, then started to walk down the street, pushing the elephant from behind.

Malai knew there wasn't much she could do. She set off toward home. Upon her arrival, her mother was making tom yum, a popular and spicy Thai soup. Malai walked over to the kitchen counter and began chopping up spices to add to the soup.

"Mom, I know what I want to do during the summer before school starts again," Malai said. "I want to go volunteer at an elephant sanctuary."

* * *

Summer came quickly, and suddenly Malai was standing in front of Boon Lot's Elephant Sanctuary in northern Thailand. Her mom and dad both supported her wish to spend a few months at the sanctuary learning about the rehabilitation of the animals she so often saw in the streets of Bangkok.

"Welcome to the sanctuary!" Malai looked to her right. Standing there was a man dressed in loose khaki pants and a flowing beige shirt with a floppy tan hat perched on top of his head. He smiled widely and walked over to take her bags. "I'm Matt," he said. "Let me take you to your room!"

Malai smiled back but was too absorbed in her surroundings to say anything. She followed Matt in silence, looking around at the beautiful sanctuary that would be her home for the next three months. In the distance, she could see a few baby elephants playing in a large, muddy pool. As they crossed a rickety wooden bridge, she saw elephant trunks emerging from the dense foliage, swinging up and down in a playful manner.

"Well, here we are!" Matt said as he climbed the few stairs that led up to a modest cabin. A hammock was stretched out on the porch, and inside, there was only a simple bed with a mosquito net hanging above. Off to the right were four more cabins for other volunteers.

Matt noticed Malai's gaze drifting toward the other rooms. "Oh, they're all off doing their chores," he said. "You'll start on those tomorrow!"

* * *

At 6 a.m. sharp the next morning, Malai heard the sound of a bell ringing in the distance. "It's way too early for that to be the wake-up call," she thought. But just as she closed her eyes, she heard the loud creak of the floorboards in the adjacent room-the other volunteers were getting up. She had met them the previous night at dinner. There were Bill and Jane, a young couple from Australia; Aaliyah, a college student from California; Rupon, a man from southern India; and lastly, Harriet, an older woman from London. Malai thought they were all incredibly kind, and so passionate about saving elephants from horrible living conditions.

The first task on the day's schedule was to walk the elephants to their new campsite in the forest. Volunteers had built a new shelter for rescued animals by planting trees in areas that had previously been cleared by villagers to create farmland.

On their way to pick up the elephants, Bill mentioned to Malai that they had just rescued one new elephant from a tourist camp nearby. Malai knew about these camps but had never been to one-she knew the horrific ways the camp owners treated the elephants. Tourists visit these camps daily, unaware of the inhumane treatment of the animals. The animals are made to perform tricks for audiences, and if they don't perform correctly, they are severely beaten. They are forced to give rides to people all day long, and the harness that is strapped to their backs harms their bodies. On top of

everything else, they're not fed well.

When the group arrived at the elephant shelter, Malai could easily point out the new rescued animal on her own. On the baby's head were harsh white scars that stood out against its wrinkly, gray skin. Bill said that the scars came from the previous mahout's knife. Malai cringed at the thought. She walked over to the elephant and gently put her hand on the trunk. The baby responded by putting his trunk on Malai's shoulder.

"All right, guys, let's start hiking!" Matt called out to everyone. Everyone remained mostly silent throughout the walk to the new encampment, still tired from waking up so early. But Malai knew everyone was happy to be there. The baby elephant remained by Malai's side during the entire journey.

Name: _____ **Date:** _____

1. According to the passage, what is a 'mahout'?

A. someone who rides and looks after an elephant

B. a celebration of the Thai New Year

C. a volunteer at an elephant sanctuary

D. a stick with a metal spike on the end

2. Based on the passage, how can Malai best be described?

A. cranky and easily annoyed

B. determined and passionate

C. young and easily bored

D. uncaring and selfish

3. Elephants are caring creatures.

What evidence from the passage supports this statement?

A. At tourist camps, elephants are capable of performing impressive tricks for audiences.

B. Elephants get tired when they work in the heat for too long.

C. Many elephants are used to give rides to people all day long.

D. When Malai placed her hand on the baby elephant's trunk, the elephant placed her trunk on Malai's shoulder.

4. What is the main reason Malai decides to volunteer at the elephant sanctuary during the summer?

A. The heat of the summer and the crowds of tourists in Bangkok made her want to get away from the city.

B. The mistreatment of the baby elephant by the mahout, and the mahout's dismissal of her concern, made her want to do something to help all elephants.

C. The mistreatment of elephants has always been a huge concern of hers, and she has always wanted to work in a sanctuary.

D. The mistreatment of the baby elephant by the mahout made her want to find a way to convince the mahout to treat his elephant better.

5. What is this passage mostly about?

A. a girl's new mission to help train elephants for tourist camps

B. a girl's new mission to learn about and help rehabilitate elephants

C. a girl's dislike for the tourists in her home country

D. a girl's adjustment to her new tasks at an elephant sanctuary

6. Read these sentences from the passage.

"On the baby's head were harsh white scars that stood out against its wrinkly, gray skin. Bill said that the scars came from the previous mahout's knife. Malai **cringed** at the thought."

What does the word "cringed" most nearly mean here?

A. dismissed with annoyance

B. laughed with disbelief

C. shrank back in fear

D. shuddered with disgust

7. Choose the answer that best completes the sentence below.

Malai decided to spend her summer volunteering at an elephant sanctuary _____ seeing a mahout mistreat his elephant in the streets of Bangkok.

A. despite

B. prior to

C. after

D. in lieu of

8. What jobs or tasks do elephants in Thailand perform, according to the passage?

_____

_____

_____

9. List three ways mentioned by the passage that elephants in Thailand are mistreated.

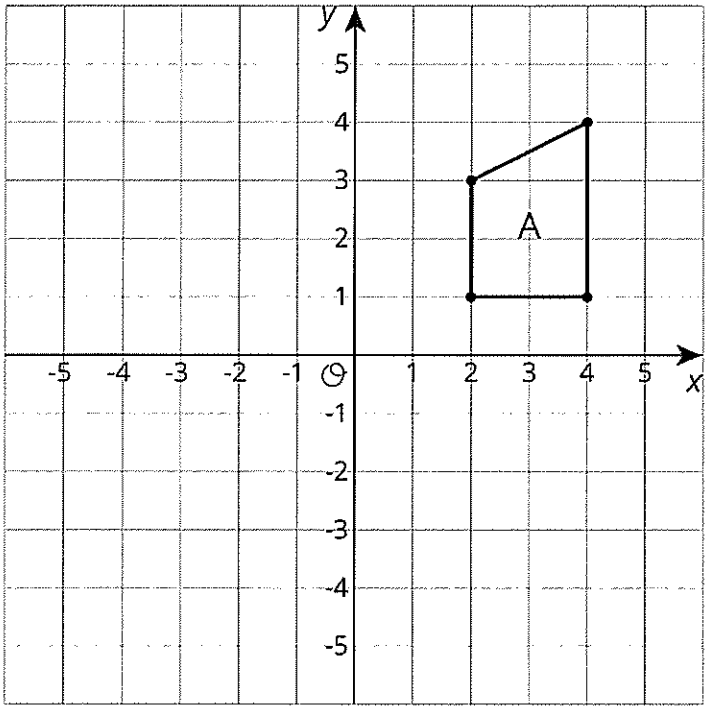
10. How does the large presence of tourists in Thailand affect the well-being of working elephants? Use evidence from the text to support your answer.

NAME DATE PERIOD

Unit 1, Lesson 6

Practice Problems

1. Here is Trapezoid A in the coordinate plane:



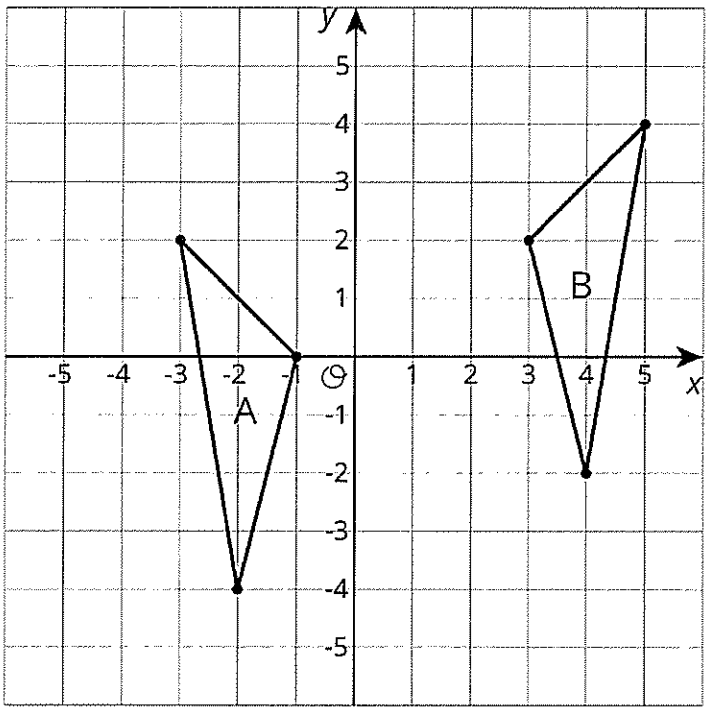
   a. Draw Polygon B, the image of A, using the y-axis as the line of reflection.
   b. Draw Polygon C, the image of B, using the x-axis as the line of reflection.
   c. Draw Polygon D, the image of C, using the x-axis as the line of reflection.

2. The point $(-4, 1)$ is rotated 180 degrees counterclockwise using center $(-3, 0)$. What are the coordinates of the image?

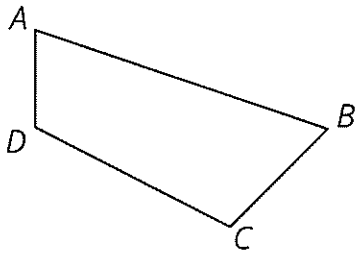
   A. $(-5, -2)$
   B. $(-4, -1)$
   C. $(-2, -1)$
   D. $(4, -1)$

NAME DATE PERIOD

3. Describe a sequence of transformations for which Triangle B is the image of Triangle A.



4. Here is quadrilateral $ABCD$.



Draw the image of quadrilateral $ABCD$ after each transformation.

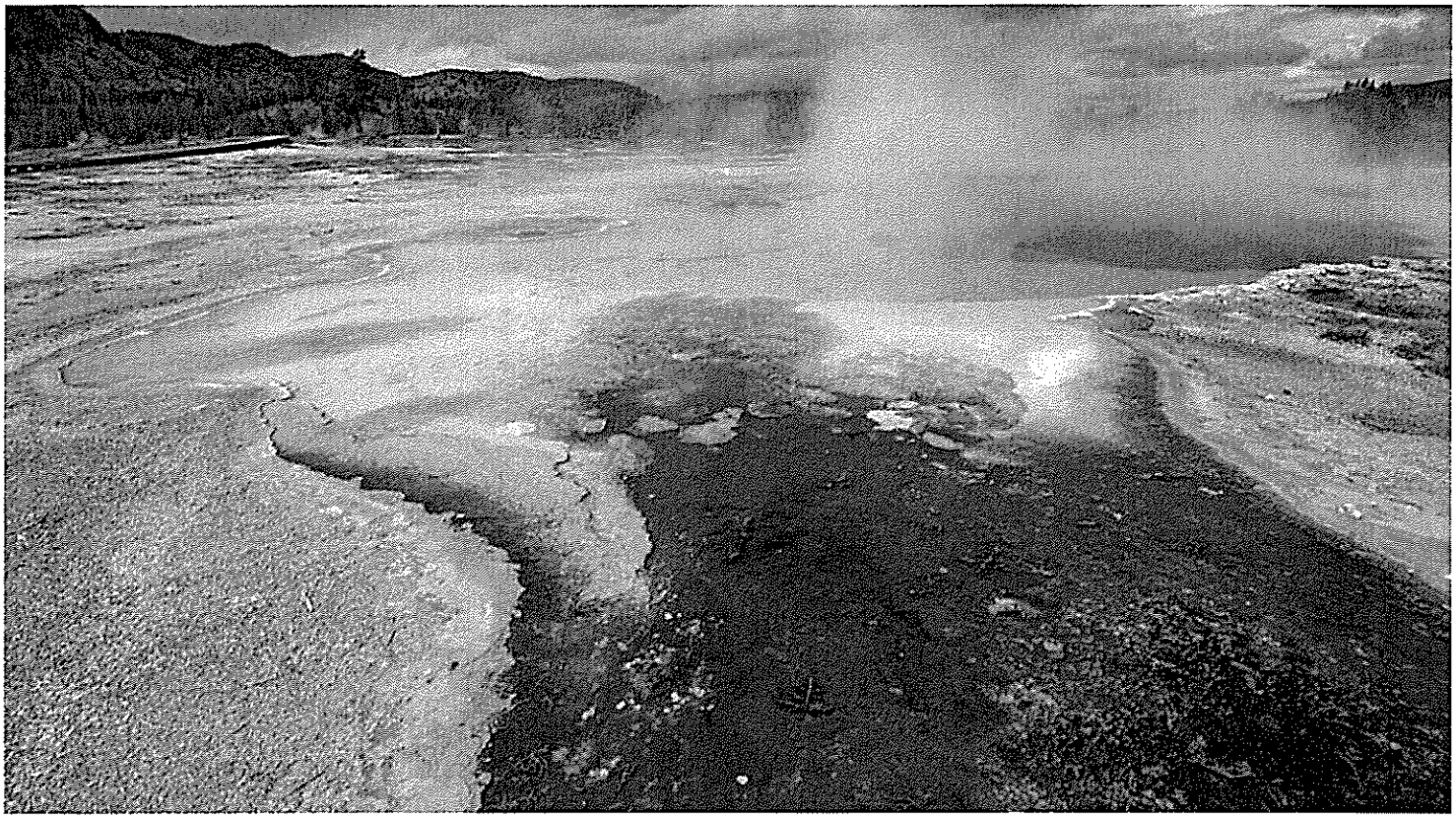
a. The translation that takes B to D.

b. The reflection over segment BC.

c. The rotation about point A by angle DAB, counterclockwise.

Should Yellowstone's Supervolcano be used for energy?

By National Geographic, adapted by Newsela staff on 09.05.18
Word Count **678**
Level **850L**



The striking colors of the landscape make it easy to forget that Yellowstone National Park springs is a supervolcano way past its eruption due date. Photo: Russell Pearson/Barcroft Images/Barcroft Media via Getty Images

Yellowstone National Park is boiling. The Wyoming park is filled with hot springs, geysers and steam vents. All are fueled by a bubbling supervolcano.

Yellowstone sits on top of a huge chamber below the Earth's surface filled with hot fluid called magma. Scientists agree that the Yellowstone supervolcano is not likely to blow anytime soon. However, if it does erupt, it would be a disaster. The eruption would shoot out enough rock and ash to cover most of the United States. There could be so much smoke that the sun would be hidden, plunging Earth into a volcanic winter.

In 2017, NASA scientists began trying to figure out a way to stop a future super-eruption. The study was led by Brian Wilcox. His team came up with the idea of drilling a series of wells around the edge of the park and pumping cold water down into the hot rock. This would cool down Yellowstone's magma chamber and prevent a disaster.

Doing this would have one other big advantage. It would unleash enough geothermal energy to power the entire country.

Scientists Say Geothermal Energy Makes Sense

Geothermal energy is built up and stored beneath the surface of the Earth. It can be used to create electricity and to heat buildings.

Geothermal power is an excellent alternative to oil and gas. These two energy sources are called fossil fuels. Fossil fuels create greenhouse gasses, which are a major cause of global warming. Geothermal energy can be made all the time, unlike other environmental energy sources like solar power and wind power. It's even cheap, once a power plant is up and running.

However, Wilcox's plan is unlikely to happen anytime soon. Power plants and drilling are not allowed in Yellowstone or other national parks. They are banned to make sure the parks remain unspoiled.

Many geothermal experts agree that Yellowstone should remain untouched. Geothermal energy has many benefits, but it also comes with serious risks. One is the possibility of causing damage to the environment.

Two Countries, Two Different Results

Take the case of New Zealand. The island nation's Wairakei Basin once had 70 geysers that fired jets of water into the air. Then in 1958, a geothermal power plant was developed nearby.

Today, Wairakei does not have a single geyser. The power plant destroyed all 70 because it took water from underground. It interrupted the geysers' natural processes. The region is now silent and cold.

However, supporters of geothermal energy use argue that scientists have learned how to prevent such damage. Scientist Helen Robinson points to Iceland as an example. It has been able to use volcanic power with little environmental harm. Roughly 90 percent of Icelanders live in geothermally heated homes. Twenty-five percent of the country's electricity is produced by geothermal power.

Robinson says this has been possible because Iceland's geothermal power companies carefully consider where to drill. They keep wells far away from geysers.

In addition, there are now new approaches to geothermal engineering that avoids water systems altogether. Engineers drill tens of thousands of feet until they hit hot bedrock where there is no water. Then they inject cold water to make steam. In turn, that steam creates geothermal power.

Power Plants Are Not Welcome At Yellowstone

Engineers could use that approach at Yellowstone. If they did, they would not damage the park's geysers and hot springs, says geothermal energy expert Maria Richards.

Even so, Richards does not want a power plant anywhere near Yellowstone. Her reason is simple. The power plant would be ugly, she says. It would turn a beautiful park into an factory zone, crisscrossed with power lines. For that reason alone, many people oppose the idea.

Even Wilcox is not sure what to think.

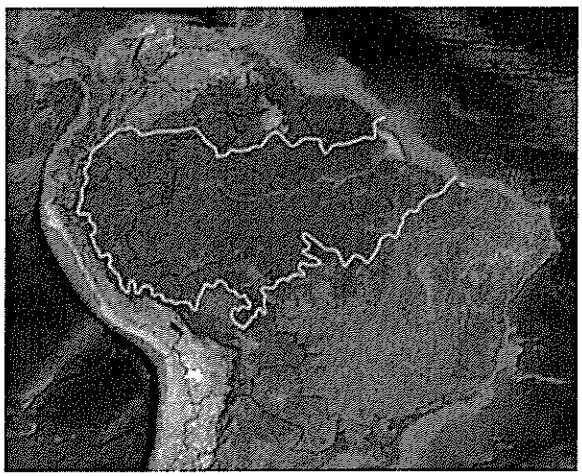
"I've been to Yellowstone many times myself — I love it," he says. "I certainly would like to see my grandchildren have the same experience that I had."

At the same time, Wilcox wants to prevent the supervolcano eruption. This would not just destroy the park but have lasting effects on the whole world.

Day 3

The Amazon Rainforest

by ReadWorks



The Amazon rainforest in South America is an amazing place. Filled with beautiful tropical flowers, towering trees, colorful parrots, and poisonous fish, it has some of the greatest levels of biodiversity of any region in the world. This means there are more different kinds of animal and plant species in this forest than in most other places. There are also many different kinds of human cultures that exist in this rainforest, from indigenous tribes to modern farmers. While all environments change over time, some scientists think that rapid human development is changing the Amazon too quickly. These changes are putting some plants, animals, and humans in danger.

The Amazon region, which stretches across the countries of Brazil, Peru, Columbia, Venezuela, Ecuador, Bolivia, Guyana, Suriname, and French Guiana (see map above), contains over half of the planet's remaining rainforests. Rainforests are well-known for being great habitats for animals and plants, as they get a lot of water, which all species need to survive. Today, the Amazon rainforest is home to 40,000 plant species, 2.5 million insect species, 378 reptile species, and 427 mammal species, including humans. You'd need a huge zoo to hold all the animals in this rainforest!

This remarkable rainforest region is also home to 400 different indigenous Amazonian tribes, many with their own unique languages and names, such as the Yanomami tribe and the Nukak tribe. Some tribes live in villages along the rivers in the Amazon rainforest, growing vegetables and fruits like corn, beans, and bananas. Others are "nomadic," which means they move from place to place. These tribes get food by hunting and fishing, using poison darts, bows and arrows, spears, or sometimes shotguns to catch their dinner. Some tribes have had ongoing contact with the outside world and access to Western doctors and healthcare; others have never been contacted by outsiders at all, since the center of the Amazon rainforest can only be reached by traveling along piranha-infested rivers.

Another important fact about the Amazon rainforest is its role in storing carbon dioxide for our earth. Since it contains so many trees, which absorb carbon dioxide the way we breathe oxygen, the rainforest acts like the lungs of our planet. And since carbon is a "greenhouse gas" that heats up our atmosphere, the Amazon helps to keep our planet cool by storing carbon in its plants. So, even though the Amazon is far away from many places in the world, it still plays an important role in our world ecosystem.

Unfortunately, many of the amazing plants, animals, and humans in the Amazon are under threat. People are using the Amazon to grow plants for humans, like bananas and sugar cane plants. Others are digging holes in the earth to look for oil or gas reserves. And still others are cutting down the trees for lumber. To do this, developers are building farms, roads, and factories in areas where rare plants

and animals thrive. This is a big problem for several reasons.

First, these changes in the Amazon will decrease the biodiversity of the rainforest. This means there will be fewer rare plant and animal species living there, and some species may go extinct as their habitat changes. Second, as the plants and animals die, the indigenous peoples who depend on them for food will also suffer from hunger. Third, when outsiders travel through the area via roads, they bring new diseases that can kill the native peoples. Finally, as new farms and factories begin to replace the forests and villages in the Amazon, they will produce more carbon dioxide, and there will be fewer trees to absorb this gas. So everywhere in the world we may feel the loss of the rainforest as our planet heats up.

But there is good news. Many groups of volunteers, doctors, and environmentalists are teaming up to protect the Amazon. They are spreading the word to students like you about the plight of the rainforest and asking people to help. Some organizations are helping to buy up land so that it cannot be used for farming. Other organizations are fighting against the governments that want to build roads, arguing that they will endanger too many plant and animal species. And others are helping to provide medicine and healthcare to the indigenous tribes in the Amazon, to help these populations cope with the big changes in their habitat. Many hope that there is still a way to save the rainforest and all of the plants and animals inside it.

Name: _____ **Date:** _____

1. Why is the Amazon rainforest in danger?

A. The rainforest has some of the highest biodiversity.

B. Human development is changing the rainforest too quickly.

C. The indigenous tribes have no contact with the outside world.

D. It is home to 2.5 million insect species.

2. Trees are being cut down for lumber in the Amazon. In addition, new farms and factories are beginning to replace the forests and villages. What is an effect of this human activity?

A. more carbon dioxide can be absorbed by the Amazon rainforest

B. new diseases will be brought to the rainforest and harm indigenous tribes

C. the planet's atmosphere will gradually begin to cool down

D. less carbon dioxide is being absorbed by the Amazon rainforest

3. The indigenous tribes in the Amazon rainforest have different cultures and ways of life. What evidence from the passage best supports this statement?

A. Some tribes are nomadic, while others are settled in one place.

B. Indigenous tribes rely on native plants and animals for food.

C. Different tribes have different names, like Yanomami and Nukak.

D. Some tribes have no contact with the outside world.

4. Read the following sentences: "People are using the Amazon to grow plants for humans, like bananas and sugar cane plants. Others are digging holes in the earth to look for oil or gas reserves. And still others are cutting down the trees for lumber."

Based on this information, what is the main reason why humans are changing the Amazon rainforest?

A. the preservation of rare plant and animal species

B. bringing modern technology to indigenous tribes

C. the desire for more resources

D. minimizing carbon dioxide in the atmosphere

5. What is this passage mostly about?

A. dangers faced by the Amazon rainforest

B. how volunteers are working to save the rainforest

C. how the rainforest can help moderate global warming

D. biodiversity in the Amazon rainforest

6. Read the following sentences: "While all environments change over time, some scientists think that **rapid** human development is changing the Amazon too quickly. These changes are putting some plants, animals, and humans in danger."

What does "**rapid**" mean as used in this sentence?

A. detailed

B. expensive

C. advanced

D. very fast

7. Choose the answer that best completes the sentence below.

The Amazon rainforest is being threatened by human development; _____, many volunteers, doctors, and environmentalists are working to protect the rainforest.

A. ultimately

B. as a result

C. namely

D. after

8. What is one thing people are doing in the Amazon which is threatening the Amazon rainforest?

_____

_____

_____

9. Explain how changes to the Amazon rainforest harm its indigenous tribes.

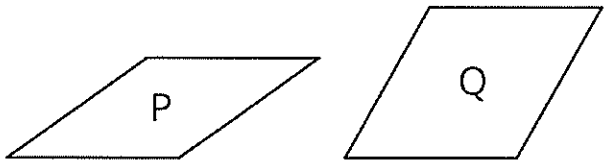
10. Explain how humans might be able to reduce the harm caused by changes to the Amazon rainforest.

NAME DATE PERIOD

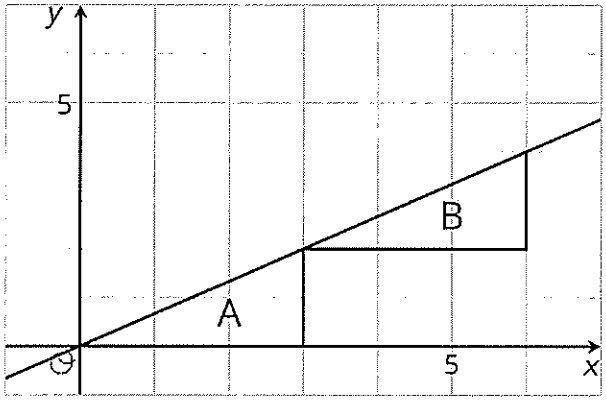
Unit 1, Lesson 7

Practice Problems

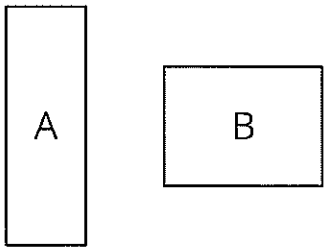
1. Is there a rigid transformation taking Rhombus P to Rhombus Q? Explain how you know.



2. Describe a rigid transformation that takes Triangle A to Triangle B.



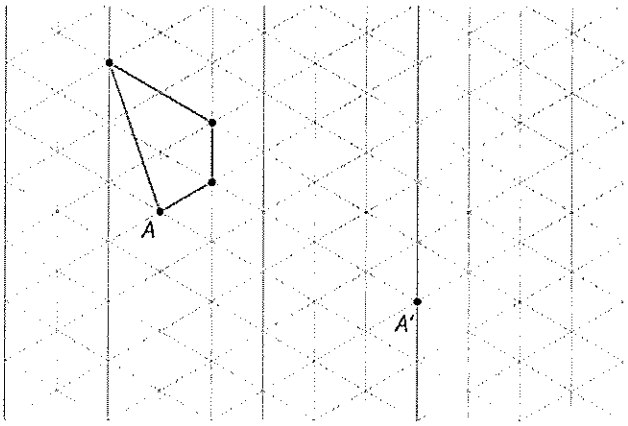
3. Is there a rigid transformation taking Rectangle A to Rectangle B? Explain how you know.



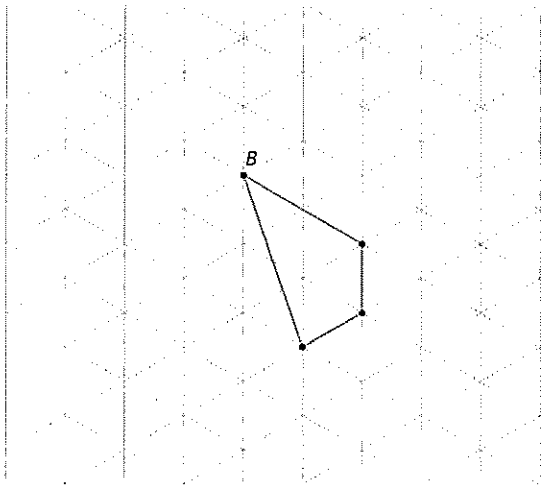
NAME DATE PERIOD

4. For each shape, draw its image after performing the transformation. If you get stuck, consider using tracing paper.

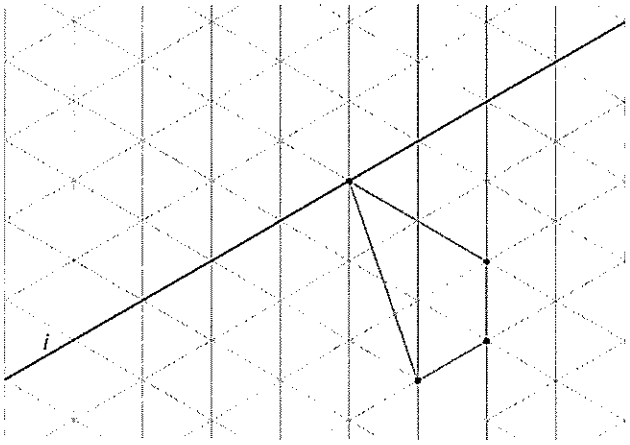
   a. Translate the shape so that A goes to A'.



   b. Rotate the shape 180 degrees counterclockwise around B.

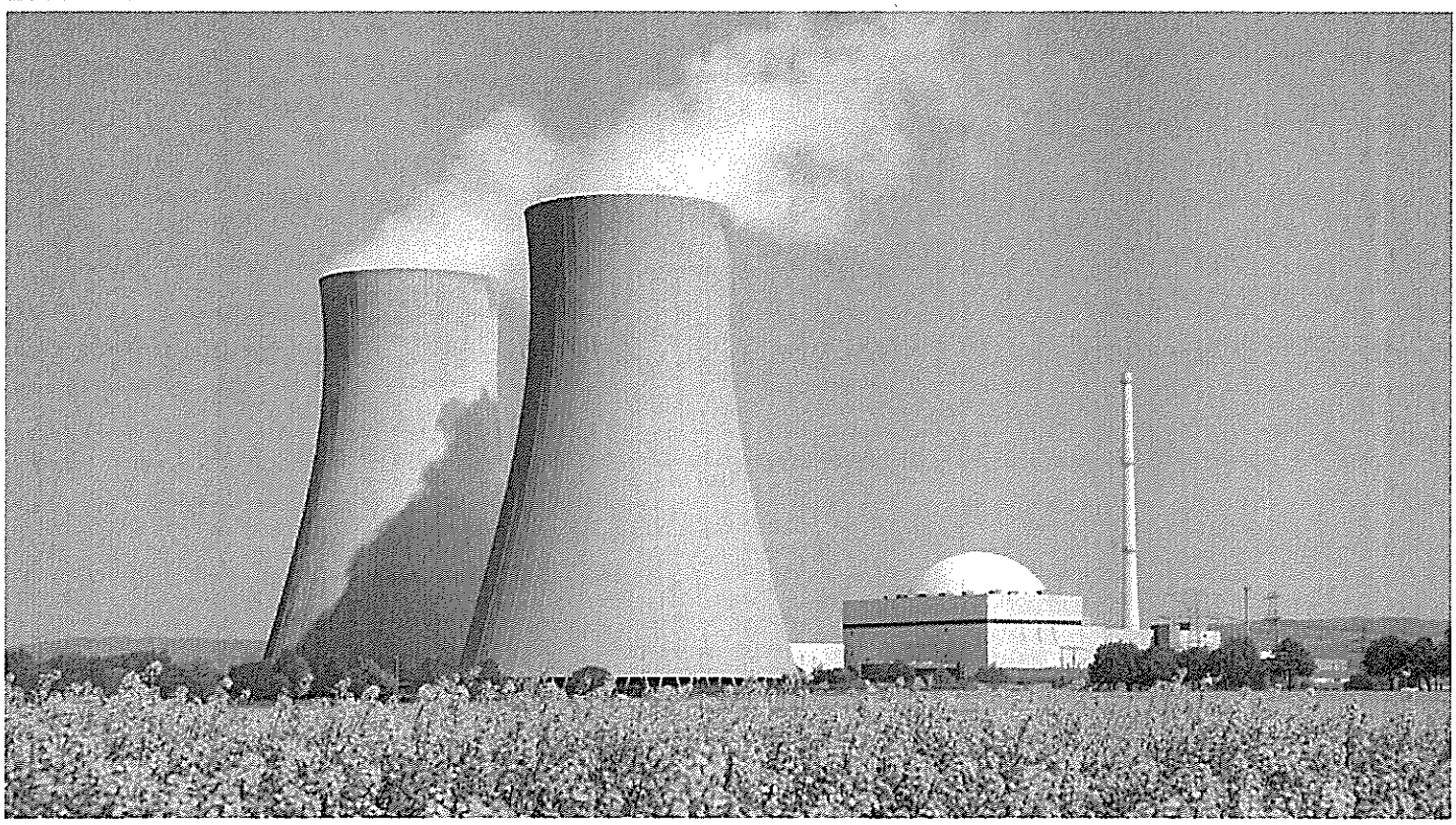


   c. Reflect the shape over the line shown.



Nuclear power as an energy source has its pros and cons

By National Geographic Society, adapted by Newsela staff on 10.30.19
Word Count **982**
Level **1050L**



About 450 nuclear reactors, including this one in Germany, provide about 11 percent of the world's electricity. Photo by: RelaxFoto.de/Getty Images

Nuclear power is generated by splitting atoms. These are the tiny particles that are the building blocks of all matter. All atoms have a central core called a nucleus that consists of protons and neutrons. Splitting atoms releases the energy held in the nucleus. This process, called nuclear fission, generates heat that is then directed to a cooling agent, which is usually water. This creates steam. The steam spins a turbine connected to a generator, producing electricity.

About 450 nuclear reactors provide about 11 percent of the planet's electricity. The countries that generate the most nuclear power are the United States, France, China, Russia, and South Korea.

The Role Of Uranium In A Nuclear Reaction

Nuclear fuel is the fuel that is used in a reactor to help sustain a nuclear reaction. The most common fuel for nuclear power is an element called uranium. This is used as fuel in nuclear reactors because its atoms can be split apart easily. Uranium is an abundant metal found throughout the world. It can be mined and processed into a version known as U-235.

During a nuclear reaction, neutrons, which are subatomic particles that have no electric charge, collide with atoms and cause them to split. That nuclear fission releases more neutrons that react with more atoms, creating a chain reaction. During the reaction, a byproduct called plutonium is produced. Plutonium is a radioactive chemical element that can also be used as nuclear fuel.

Two types of nuclear reactors are commonly used in the United States: boiling water reactors and pressurized water reactors. Both types of reactors produce steam. In boiling water reactors, the water is heated to the boiling point to release steam. In pressurized water reactors, pressurized water does not boil, but funnels heat to a secondary water supply for steam generation. Other types of nuclear power reactors include gas-cooled reactors and fast neutron reactors. Gas-cooled reactors use carbon dioxide as the cooling agent. These are used often in the U.K. Fast neutron reactors are cooled by liquid sodium.

Competing With Wind And Solar Energy

The idea of nuclear power began in the 1930s, when physicist Enrico Fermi first showed that neutrons could split atoms. Fermi led a team that achieved the first nuclear chain reaction, under a stadium at the University of Chicago, in 1942. The first electricity from atomic energy was produced at Idaho's Experimental Breeder Reactor I in 1951. The first nuclear power plant was built in the city of Obninsk, part of the former Soviet Union, in 1954. The first commercial nuclear power plant was built in Shippingport, Pennsylvania in 1957.

Nuclear power isn't considered renewable energy because it is dependent on uranium. This element is a mined, limited resource. However, operating reactors do not release any of the greenhouse gases that contribute to global warming. This is why supporters say it should be considered a climate change solution. Leslie Dewan is an engineer who works with National Geographic. She wants to bring back the molten salt reactor. This type of reactor uses liquid uranium dissolved in molten salt as fuel. Dewan argues molten salt reactors could be safer and less costly than reactors in use today.

Other people are working on smaller reactors that could be portable and easier to build. Inventions like those are aimed at saving the nuclear power industry, which is in trouble. The nuclear plants in operation today are getting older. New ones are more expensive than other energy options, like natural gas and renewable resources such as wind and solar.

The best bet for the future of nuclear power involves nuclear fusion. While nuclear fission splits the nucleus, nuclear fusion does the opposite. Nuclear fusion generates energy when two light nuclei smash together to form a single, heavier nucleus. Fusion could deliver more energy more safely and with far less harmful radioactive waste than fission. However, only a small number of people have managed to build working nuclear fusion reactors. One of those people is a 14-year-old from Arkansas. Organizations such as ITER in France and Max Planck Institute of Plasma Physics in Germany are working on commercially affordable versions. So far, however, that goal has been difficult to achieve.

Nuclear Power Not The Safest Option

When arguing against nuclear power, opponents often point to two problems. The first is long-lived nuclear waste, and the second is rare but devastating nuclear accidents. Two such accidents were Chernobyl in 1986 and Fukushima Daiichi in 2011. The deadly Chernobyl disaster occurred

in Ukraine, a country in eastern Europe. The accident happened when flawed reactor design and human error caused a power surge and explosion at one of the reactors. A large amount of radioactivity was released into the air, and hundreds of thousands of people were forced from their homes. Today, the area surrounding the plant, which is known as the Exclusion Zone, is open to tourists. However, it is only inhabited by various wildlife species such as gray wolves.

In the case of Japan's Fukushima Daiichi, the Tohoku earthquake and tsunami caused the accident. The surrounding towns still have not recovered. Evacuees remain afraid to return and public mistrust has slowed the recovery effort.

There was also a partial meltdown at Pennsylvania's Three Mile Island in 1979. These accidents remain terrifying examples of nuclear power's radioactive risks. The Fukushima disaster in particular raised questions about the safety of power plants in earthquake zones. One such questionably-placed reactor is the Metsamor power station in Armenia, a small country in eastern Europe.

Another issue related to nuclear power is where and how to store the spent fuel, or nuclear waste. This waste remains dangerously radioactive for thousands of years. Many nuclear power plants are located on or near coasts because of the closeness to water for cooling. However, this means they must face rising sea levels and extreme storms due to climate change.

Day 4

The Reader

by ReadWorks

It was a stormy Thursday evening, much like any other, when Jorge hung the "Do Not Disturb" sign outside his bedroom door. The sign was part of an agreement he had with his parents. Jorge's parents were big believers in personal privacy and would do their best not to bother him when that sign was on his door. In return, Jorge never put the sign on the door unless all of his chores were completed and he had finished his homework.

Closing the door behind him, Jorge turned back into his bedroom. The navy blue walls glowed in the lamplight as his feet padded across soft carpet to the tall steel bookshelves that lined the side of the room. Jorge ran his finger across the spines of the books neatly lined up like soldiers at attention. What did he want to read this evening? Jorge loved this moment of anticipation, when he hadn't yet decided what he wanted to read and the evening held unforeseen adventures. It was almost better than the actual moment when he sank into his armchair and disappeared into the foreign, exciting world of a new book. Almost.

Some people read books to glean information. Others read books to improve themselves. Finally, there are those people who read books to escape. Jorge was part of this third group of readers. It wasn't that Jorge's life was especially horrible. He had friends whom he played basketball with every week, and he liked his classmates at school. But Jorge felt like his life was lived in shades of gray, while the books he read were in bright, vivid Technicolor. There just wasn't much happening in his small, Midwestern town. There were thirty-nine kids in his ninth-grade class; they were the same thirty-nine kids who had been in his kindergarten class. They would probably be the same thirty-nine people in his senior class. Jorge loved his parents, but they were both accountants and had been doing the same job every day of his entire life. They weren't exactly the stuff of intrigue and adventure.

Jorge's favorite books were about spies. Reading about counter-terrorism units and political assassins made his heart race, in a good way. But on this particular Thursday, Jorge wasn't in the mood for spy novels. He let his hand drift past them and skipped over the science fiction. None of his usual favorites appealed to him today.

Jorge was about to turn away from the bookshelf in surrender when he glimpsed a battered leather book on one of the bottom shelves. The book was so old that the gilded title on the spine had worn off. Jorge gently pulled the book out and opened it. He slowly flipped through the delicate, yellowed pages to the title page. "The Armchair Traveler," by Herman Castillo, Jorge read. He didn't recognize the title or the author. His grandfather had sent a box of old books to Jorge last month, and this book must have been in that pile. Perhaps his mother or father had placed it on the shelf.

"Well," Jorge thought to himself, "this is definitely better than going downstairs to help wash the dishes." He went to his armchair and settled into a comfortable position against the smooth, caramel leather. He pulled the lamp closer to light the pages. Then, comfortably situated and ready to begin, Jorge opened the book.

The first page after the title only had a single word on it: "Beware." The writing was bold and black, a warning. Goosebumps rose on Jorge's arms, but he turned the page, eager to read on. Two

sentences, in italics, sat in the middle of the second page: "*Those who travel from the safety of an armchair like to think they are safe. They are wrong.*"

Jorge smiled in satisfaction. He wasn't quite sure what those sentences meant, but they sounded promisingly threatening. "Now this is more like it," he thought. "This is the kind of beginning a mysterious thriller should have."

Jorge flipped the page again to the beginning of Chapter 1.

Outside rain poured and thunder boomed but inside the house it was warm and dry. Suddenly, there was a knock at the window-

Jorge jumped as he heard a loud noise outside. He looked up at the window, but it was just the wind knocking a tree branch against the windowpane. Jorge turned his attention back to the page.

Suddenly, there was a knock at the window. George knew better than to open the window on a dark and stormy night, however. Strange things had been happening in town recently. People had been disappearing, some of them from the safety of their own homes. No one ever saw anyone leave, but every morning more and more houses were empty. It was enough to make a man refuse to answer a knock on the window on a stormy night.

BANG! Jorge jumped as the tree branch hit his window again. He began to wish he had chosen another book to read, but somehow he just couldn't bring himself to put this one down. He continued down the page.

The knocking stopped and George hoped that whoever it had been would move along to the next house. He turned back to the bookshelves that lined his room, neatly lined with his favorite novels. He selected one and was about to begin reading when he heard a long, groaning creak. It seemed to come from behind the bookshelves, but that was impossible. The wall behind the bookshelves was solid stone. Still George reached out and pushed, tentatively, on the bookshelf. It swung open to reveal a secret passage. George knew the passage hadn't been there that morning.

Jorge sighed happily. He loved stories that began with secret passages, and this one looked like it would be good. Before he could continue reading, however, he heard a noise. Not just any noise, but a long, groaning creak. Jorge lifted his eyes to the bookshelves on the other side of the room. He could have sworn that the sound came from the bookshelf. He got up, slowly, and approached. This was crazy; he knew there was nothing behind the bookshelf. He had bought the shelf with his father and put it against the solid plaster wall of his bedroom. But still, Jorge reached out to push the bookshelf. He watched as, slowly but surely, the bookshelf swung open. Behind it was a long, dark passage.

A blast of cold air rushed up from the passage and hit Jorge in the face. He looked down at the book in his hand. He looked at the dark tunnel. He could see a gleam of light somewhere farther down the tunnel. Jorge took a deep breath and stepped hesitatingly into the passage. The bookshelf suddenly slammed shut behind him, cutting him off from his bedroom. He rushed to push it open, but the bookshelf wouldn't budge. Jorge held the book tightly and steeled his nerves. If he couldn't go back, he could only go forward. Jorge began walking away from his bedroom, away from his armchair and the comfort of his home. Each step took him farther into the dark and mysterious tunnel.

Name: _____ Date: _____

1. Why does Jorge read books?

A. to feel like he has friends

B. to escape

C. to glean information

D. to improve himself

2. What is the setting of this story?

A. Jorge's backyard on a chilly Thursday morning

B. Jorge's bathroom on a humid Thursday night

C. Jorge's front porch on a warm Thursday afternoon

D. Jorge's bedroom on a stormy Thursday evening

3. Read these sentences from the text.

It wasn't that Jorge's life was especially horrible. He had friends whom he played basketball with every week, and he liked his classmates at school. But Jorge felt like his life was lived in shades of gray, while the books he read were in bright, vivid Technicolor. There just wasn't much happening in his small, Midwestern town. There were thirty-nine kids in his ninth-grade class; they were the same thirty-nine kids who had been in his kindergarten class. They would probably be the same thirty-nine people in his senior class. Jorge loved his parents, but they were both accountants and had been doing the same job every day of his entire life. They weren't exactly the stuff of intrigue and adventure.

Based on this evidence, what does Jorge think about his life?

A. Jorge thinks his life is boring.

B. Jorge thinks his life is full of adventure.

C. Jorge thinks his life is intriguing.

D. Jorge thinks his life is horrible.

4. Based on the information in this story, how does Jorge probably feel when he reads?

A. Jorge probably feels uncomfortable when he reads.

B. Jorge probably feels excited when he reads.

C. Jorge probably feels nervous when he reads.

D. Jorge probably feels tired when he reads.

5. What is a theme of this story?

A. If kids are given too much freedom, they will get into trouble.

B. Reading can be an escape from a boring life.

C. You cannot always count on your friends to help you out.

D. You can always count on your family to help you out.

6. Read this sentence from the text.

Jorge ran his finger across the spines of the books neatly lined up like soldiers at attention.

What does the author mean by writing that the books are "neatly lined up like soldiers at attention"?

A. The author means that the books are standing straight up in a row.

B. The author means that the books seem to be paying attention to Jorge.

C. The author means that the books are stacked vertically in a pile that goes up to the ceiling.

D. The author means that the books are lying open on the shelf.

7. Read this sentence from the text.

There were thirty-nine kids in his ninth-grade class; they were the same thirty-nine kids who had been in his kindergarten class.

How could this sentence be rewritten without changing its meaning?

A. There were thirty-nine kids in his ninth-grade class; for instance, they were the same thirty-nine kids who had been in his kindergarten class.

B. There were thirty-nine kids in his ninth-grade class; instead, they were the same thirty-nine kids who had been in his kindergarten class.

C. There were thirty-nine kids in his ninth-grade class, and they were the same thirty-nine kids who had been in his kindergarten class.

D. There were thirty-nine kids in his ninth-grade class, so they were the same thirty-nine kids who had been in his kindergarten class.

8. Jorge starts reading a book about a character named George. Describe what happens in the book after George hears a long, groaning creak. Include two or more details from the text in your answer.

9. As he is reading, Jorge hears a long, groaning creak. Describe what happens next. Be sure to mention what Jorge does to the bookshelf.

10. Explain how the events of the book Jorge starts reading and the events of his life may be connected. Support your answer with evidence from the text.

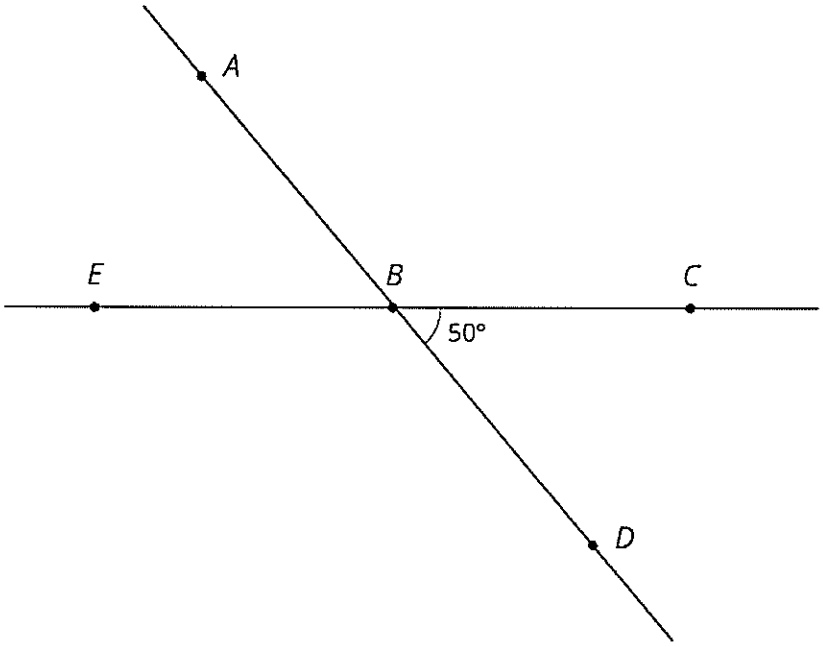
NAME DATE PERIOD

Unit 1, Lesson 9

Practice Problems

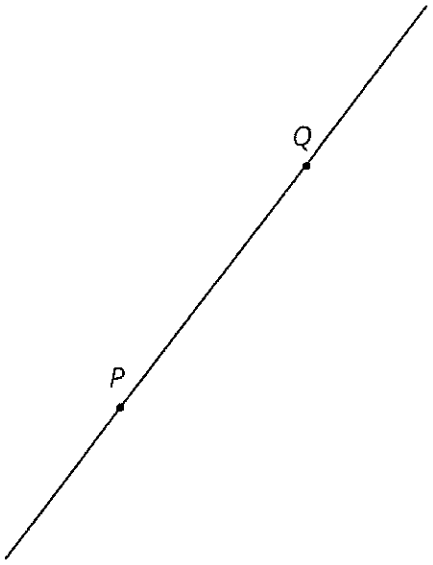
1. a. Draw parallel lines AB and CD.
   b. Pick any point E. Rotate AB 90 degrees clockwise around E.
   c. Rotate CD 90 degrees clockwise around E.
   d. What do you notice?

2. Use the diagram to find the measures of each angle. Explain your reasoning.
   a. $m\angle ABC$
   b. $m\angle EBD$
   c. $m\angle ABE$



3. Points P and Q are plotted on a line.

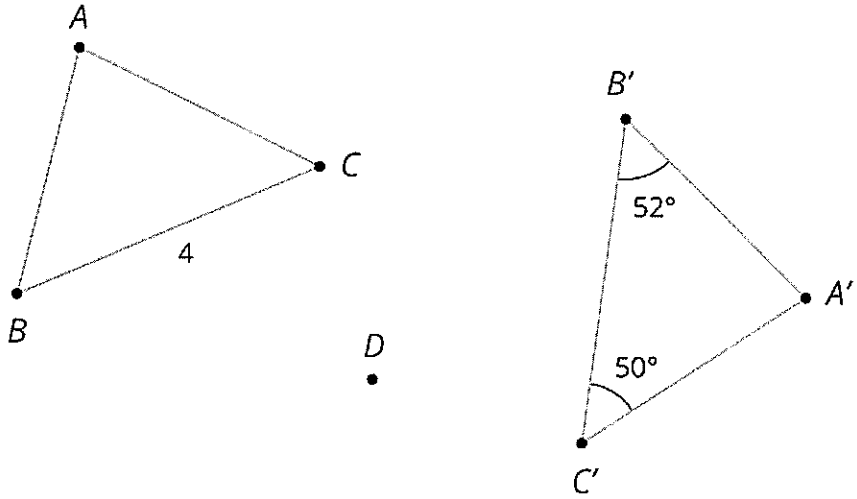
NAME DATE PERIOD



a. Find a point R so that a 180-degree rotation with center R sends P to Q and Q to P.

b. Is there more than one point R that works for part a?

4. In the picture triangle $A'B'C'$ is an image of triangle ABC after a rotation. The center of rotation is D.



a. What is the length of side $B'C'$? Explain how you know.

b. What is the measure of angle B? Explain how you know.

c. What is the measure of angle C? Explain how you know.

NAME DATE PERIOD

5. The point $(-4, 1)$ is rotated 180 degrees counterclockwise using center $(0, 0)$. What are the coordinates of the image?

   A. $(-1, -4)$

   B. $(-1, 4)$

   C. $(4, 1)$

   D. $(4, -1)$

NAME DATE PERIOD

Unit 1, Lesson 11

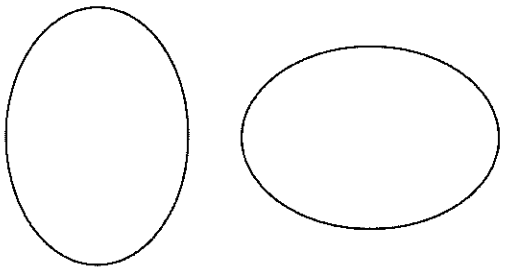
Practice Problems

1. If two rectangles have the same perimeter, do they have to be congruent? Explain how you know.

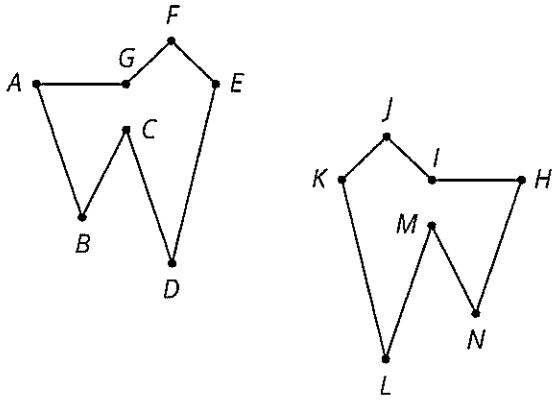
2. Draw two rectangles that have the same area, but are *not* congruent.

3. For each pair of shapes, decide whether or not it appears that the two shapes are congruent. Explain your reasoning.

a.

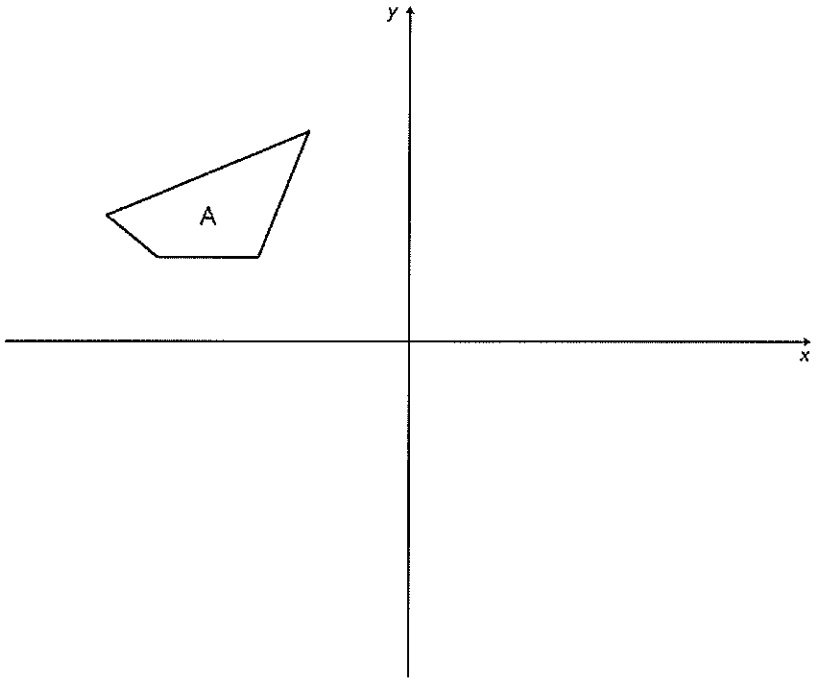


b.



4. a. Reflect Quadrilateral A over the x-axis. Label the image quadrilateral B. Reflect Quadrilateral B over the y-axis. Label the image C.

NAME DATE PERIOD



b. Are Quadrilaterals A and C congruent? Explain how you know.

5. The point $(-2, -3)$ is rotated 90 degrees counterclockwise using center $(0, 0)$. What are the coordinates of the image?

   A. $(-3, -2)$

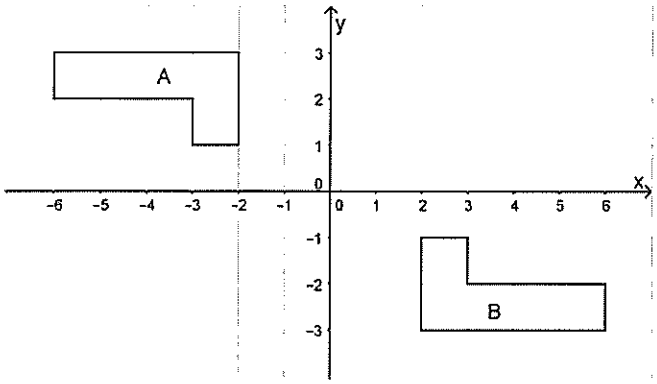
   B. $(-3, 2)$

   C. $(3, -2)$

   D. $(3, 2)$

6. Describe a rigid transformation that takes Polygon A to Polygon B.

NAME DATE PERIOD



Types of renewable energy

By National Geographic Society on 02.12.20
Word Count **1,682**
Level **MAX**

Wind turbines (left) and solar panels (right) create electricity. Photo by: Christoph Burgstedt/Science Source

The wind, the sun and Earth are sources of renewable energy. These energy sources naturally renew, or replenish themselves.

NATIONAL GEOGRAPHIC

Wind, sunlight and the Earth have energy that transforms in ways we can see and feel. We can see and feel evidence of the transfer of energy from the sun to the Earth in the sunlight shining on the ground and the warmth we feel when sunlight shines on our skin. We can see and feel evidence of the transfer of energy in wind's ability to pull kites higher into the sky and shake the leaves on trees. We can see and feel evidence of the transfer of energy in the geothermal energy of steam vents and geysers.

People have created different ways to capture the energy from these renewable sources.

Solar Energy

Solar energy can be captured actively or passively.

Active solar energy uses special technology to capture the sun's rays. The two main types of equipment are photovoltaic cells (also called PV cells or solar cells) and mirrors that focus sunlight in a specific spot. These active solar technologies use sunlight to generate electricity, which we use to power lights, heating systems, computers and televisions.

Passive solar energy does not use any equipment. Instead, it gets energy from the way sunlight naturally changes throughout the day. For example, people can build houses so their windows face the path of the sun. This means the house will get more heat from the sun. It will take less energy from other sources to heat the house.

Other examples of passive solar technology are green roofs, cool roofs and radiant barriers. Green roofs are completely covered with plants. Plants can get rid of pollutants in rainwater and air. They help make the local environment cleaner.

Cool roofs are painted white. Radiant barriers are made of a reflective covering, such as aluminum. They both reflect the sun's heat instead of absorbing it. All these types of roofs help lower the amount of energy needed to cool the building.

Advantages And Disadvantages

There are many advantages to using solar energy. PV cells last for a long time: They can operate at about 80 percent of their intended production even after about 25 to 30 years.

However, there are reasons why solar power cannot be used as the only power source in a community. It can be expensive to install PV cells or build a building using passive solar technology.

Sunshine can also be hard to predict. It can be blocked by clouds, and the sun doesn't shine at night. Different parts of Earth receive different amounts of sunlight based on location, the time of year and the time of day.

Wind Energy

People have been harnessing the wind's energy for a long, long time. More than 5,000 years ago, ancient Egyptians made boats powered by the wind. In 200 B.C., people used windmills to grind grain in the Middle East and pump water in China.

Today, we capture the wind's energy with wind turbines. A turbine is similar to a windmill; it has a very tall tower with two or three propeller-like blades at the top. These blades are turned by the wind. The blades turn a generator (located inside the tower), which creates electricity.

Groups of wind turbines are known as wind farms. Wind farms can be found near farmland, in narrow mountain passes, and even in the ocean, where there are steadier and stronger winds. Wind turbines anchored in the ocean are called offshore wind farms.

Wind farms create electricity for nearby homes, schools and other buildings.

Advantages And Disadvantages

Wind energy can be very efficient. In places like the Midwest and along coasts, steady winds can provide cheap, reliable electricity.

Another great advantage of wind power is that it is a clean form of energy. Wind turbines do not burn fuel or emit any pollutants into the air.

Wind is not always a steady source of energy, however. Wind speed changes constantly, depending on the time of day, weather and geographic location. Currently, it cannot be used to provide electricity for all our power needs.

Wind turbines can be also dangerous for bats and birds. These animals cannot always judge how fast the blades are moving and crash into them.

Geothermal Energy

Deep beneath the surface of the Earth is the Earth's core. The center of the Earth is extremely hot thought to be over 6,000 Celsius (about 10,800 Fahrenheit). The heat is constantly moving toward the surface.

We can see some of the Earth's heat when it bubbles to the surface. Geothermal energy can melt underground rocks into magma and cause the magma to bubble to the surface as lava. Geothermal energy can also heat underground sources of water and force it to spew out from the surface. This stream of water is called a geyser.

However, most of the Earth's heat stays underground and makes its way out very, very slowly.

We can access underground geothermal heat in different ways. One way of using geothermal energy is with geothermal heat pumps. A pipe of water loops between a building and holes dug deep underground. The water is warmed by the geothermal energy underground and brings the warmth aboveground to the building. Geothermal heat pumps can be used to heat houses, sidewalks and even parking lots.

Another way to use geothermal energy is with steam. In some areas of the world, there is underground steam that naturally rises to the surface. The steam can be piped straight to a power plant. However, in other parts of the world, the ground is dry. Water must be injected underground to create steam. When the steam comes to the surface, it is used to turn a generator and create electricity.

In Iceland, there are large reservoirs of underground water. Almost 90 percent of people in Iceland use geothermal as an energy source to heat their homes and businesses.

Advantages And Disadvantages

An advantage of geothermal energy is that it is clean. It does not require any fossil fuels to function properly.

A disadvantage of using geothermal energy is that in areas of the world where there is only dry heat underground, large quantities of fresh water are used to make steam. There may not be a lot of fresh water. People need water for drinking, cooking and bathing.

Biomass Energy

Biomass is any material that comes from plants, animals or microorganisms that were recently living. Plants create energy from the sun through photosynthesis. This energy is stored in the plants even after they die.

Trees, branches, scraps of bark and recycled paper are common sources of biomass energy. Manure, garbage and crops such as corn, soy and sugar cane can also be used as biomass feedstocks.

We get energy from biomass by burning it. Wood chips, manure and garbage are dried out and compressed into squares called briquettes. These briquettes are so dry that they do not absorb water. They can be stored and burned to create heat or generate electricity.

Biomass can also be converted into biofuel. Biofuels are mixed with regular gasoline and can be used to power cars and trucks. Biofuels release less harmful pollutants than pure gasoline.

Advantages And Disadvantages

A major advantage of biomass is that it can be stored and used when it is needed.

Growing crops for biofuels, however, requires large amounts of land and pesticides. Land could be used for food instead of biofuels. Some pesticides could pollute the air and water.

Biomass energy relies on biomass feedstocks plants that are processed and burned to create electricity. Biomass feedstocks can include crops such as corn or soy, as well as wood.

Hydroelectric Energy

Hydroelectric energy is made by flowing water. Most hydroelectric power plants are located on large dams, which control the flow of a river.

Dams block the river and create an artificial lake, or reservoir. A controlled amount of water is forced through tunnels in the dam. As water flows through the tunnels, it turns huge turbines and generates electricity.

Advantages And Disadvantages

Hydroelectric energy is fairly inexpensive to harness. Rivers flow all over the world, so the energy source is available to millions of people.

Hydroelectric energy is also fairly reliable. Water is constantly flowing, so the dam does not depend on the weather and time of day the way solar and wind energies do.

However, hydroelectric power plants are damaging to the environment. When a river is dammed, it creates a large lake behind the dam. This lake drowns the original river habitat deep underwater. Sometimes, people build dams that can drown entire towns underwater. The people who live in the town or village must move to a new area.

Silt, or dirt from a riverbed, can build up behind the dam and can damage the dam, shortening its life span.

Other Renewable Energy Sources

Scientists and engineers are constantly working to harness other renewable energy sources. Three of the most promising are tidal energy, wave energy and algal (or algae) fuel.

Tidal energy harnesses the power of ocean tides to generate electricity. Some tidal energy projects use the moving tides to turn the blades of a turbine. Other projects use small dams to continually

fill reservoirs at high tide and slowly release the water (and turn turbines) at low tide.

Wave energy harnesses waves from the ocean, lakes or rivers. Some wave energy projects use the same equipment that tidal energy projects do: dams and standing turbines. Other wave energy projects float directly on waves. The water's constant movement over and through these floating pieces of equipment turns turbines and creates electricity.

Algal fuel is a type of biomass energy that uses the unique chemicals in seaweed to create a clean and renewable biofuel. Algal fuel does not need the acres of cropland that other biofuel feedstocks do.

Renewable Nations

These nations produce some of the most energy using renewable resources. Many of them are also amongst the leading producers of nonrenewable energy: China, United States, Brazil and Canada.

Day 5

High Jumpers

by Stephen Fraser

Note: This article was first published in 2009.

These kangaroos live like monkeys. Can they be saved from extinction?

The local people call them the "ghosts of the rain forest." They live far out of sight, some 30 meters (100 feet) above the ground, their orange-brown fur blending with the moss on the trees. Moving nimbly across the thin branches, they venture to the ground only to gather food.

Tim Laman

These aren't plush toys; they're tree kangaroos. The ones shown here are Matschie's tree kangaroos, which live on the Huon Peninsula of Papua New Guinea.

They're tree kangaroos, among the most elusive animals on Earth. Scientists first learned about them in the 1800s, but their natural habits are still largely a mystery.

Lisa Dabek, a scientist at Seattle's Woodland Park Zoo, is trying to change that while helping to take the animals off the endangered species list.

Tree Kangaroo Research Program staff

"It's a very exciting time," she told *Current Science.* "The landowners of Papua New Guinea's Huon Peninsula are helping the rest of the world with participation in their country's first conservation area to protect these animals."

Home Videos

Dabek saw her first tree kangaroo more than 20 years ago at the Woodland Park Zoo. "I thought they were amazing!" she says. Dabek was a graduate student then, doing research on animal behavior. The tree kangaroos fascinated her so much that she dedicated her life's work to them.

Tree kangaroos are very hard to find in their native habitat. After local hunters helped Dabek spot her first wild tree kangaroo, eight years passed before she saw another one. She spotted telltale droppings on the ground and scratches in the bark of trees. A dog barked at something stirring above. Dabek looked up, and there was a tree kangaroo, looking as fuzzy and pink-nosed as a plush animal in a toy shop.

Joel Satore/National Geographic Stock

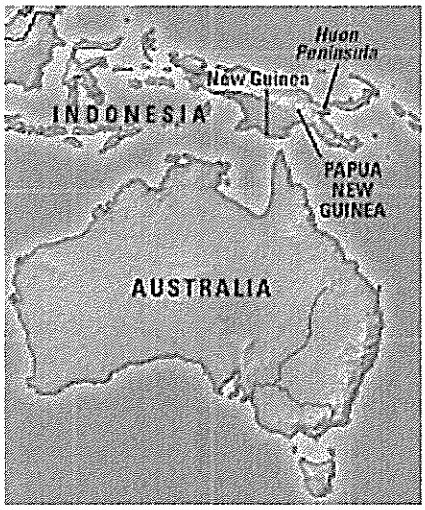
Dabek returns to Papua New Guinea every year to further the research and conservation work with her team. Thanks to a grant from the National Geographic Society (NGS), she and NGS staff recently began using a *crittercam,* a small video camera that is attached to a collared wild animal. The crittercam has offered glimpses of tree kangaroos scratching, grooming, eating, and cleaning their pouches, plus gorgeous vistas of the lush *canopy* (upper layer of a forest) where they live.

"It was beyond my wildest imagination," she says of the first images broadcast by the crittercam. "It brought tears to my eyes."

Tree to Ground

Like all kangaroos, tree kangaroos are *marsupials* (pouched mammals). Scientists know of ten species in northeastern Australia and on the island of New Guinea. The two landmasses were once connected.

Most kangaroos live on the ground in Australia, hopping around on their hind limbs at about 40 kilometers (25 miles) an hour. Some weigh as much as 90 kilograms (200 pounds) and stand more than 2 meters (6.5 feet) tall. Their *arboreal* (tree-dwelling) cousins are much smaller, about the size of large raccoons.



Joe LeMonnier

Scientists believe that all kangaroos evolved to the ground from a prehistoric tree-dwelling marsupial that looked like an opossum. Some kangaroos then evolved back into the trees. There they move with agility on all fours, using their long front claws to climb and their exceptionally long tails for balance. When they drop to the ground to find food, they free-fall from as high as 100 feet. "The soles of their feet are rubbery, which is good for gripping branches, and they glide down from the canopy, which helps them land without injuring themselves," says Dabek.

Because there are no wild primates-monkeys or apes-in Australasia, tree kangaroos occupy the niches normally taken by those animals, explains Dabek. "They essentially live like monkeys," she says.

Social Recluses

Ground kangaroos are mainly *social* animals. They live in groups-called *mobs*-of 10 or more, says Dabek. Tree kangaroos are the opposite. Males and females cohabit only during breeding time. Offspring live with their mothers for up to 18 months. From then on, their existence is solitary. When tree kangaroos do communicate, they make a shushing sound, says Dabek.

The species that Dabek and her colleagues are studying, *Matschie's tree kangaroo,* lives in only one area of Papua New Guinea, the Huon Peninsula. Its fur is reddish. Its face, ear tips, underbelly, and tail are golden.

The animals are shy around humans, says Dabek. One female-"Trish"-that Dabek has been tracking for four years will barely tolerate humans. Trish has had three offspring, each about 18 months apart. "Young kangaroos are more curious, and they will peek out of the trees for a good look," she says.

Forest Preserve

Because of overhunting and habitat loss, tree kangaroos are endangered. In 2009, after Dabek and her team spent 10 years working with hunters and landowners on the Huon Peninsula, the community set aside more than 70,000 hectares (173,000 acres) of forest for conservation. It's the first preserve of its kind in the country. People have agreed not to log, mine, or hunt tree kangaroos in the protected area, even though the animals are traditionally part of the local diet.

"I'm incredibly impressed with what the people that I've become close to are doing for conservation," says Dabek. "And pleased that the animals are now safe."

Name: _____ Date: _____

1. Tree kangaroos are marsupials. What is a marsupial?

A. a pouched mammal

B. a bird that cannot fly

C. a monkey that lives on the ground

D. a fish that lives off the coast of Papua New Guinea

2. The text describes the problem of tree kangaroos being endangered. According to the text, what solution has been adopted?

A. Tree kangaroos are being captured and cared for in local zoos.

B. A conservation area has been set aside to protect tree kangaroos.

C. Many tree kangaroos have been taken from Papua New Guinea to the United States.

D. Several scientists are adopting tree kangaroos and raising them.

3. After reading the text, what can you conclude Lisa Dabek will most likely do next?

A. She will retire from her job at Seattle's Woodland Park Zoo.

B. She will continue her research and conservation work.

C. She will open a zoo for endangered animals.

D. She will stop tracking the tree kangaroo named Trish.

4. Read this paragraph from the text:

"The animals are shy around humans, says Dabek. One female-'Trish'-that Dabek has been tracking for four years **will barely tolerate humans**. Trish has had three offspring, each about 18 months apart. 'Young kangaroos are more curious, and they will peek out of the trees for a good look,' she says."

What does the phrase "**will barely tolerate humans**" probably mean here?

A. gets along with some humans better than others

B. hates humans and tries to attack them whenever possible

C. is not very comfortable being around humans

D. does not treat humans with respect and fairness

5. What is the main idea of the text?

A. The tree kangaroo species that Dabek is studying lives on the Huon Peninsula.

B. Lisa Dabek and her staff are using a crittercam to watch tree kangaroos.

C. Tree kangaroos are tree-dwelling animals that look like plush toys.

D. Scientist Lisa Dabek is working to save tree kangaroos from extinction.

6. In what part of the world do tree kangaroos live?

7. Why might the local people call tree kangaroos the "ghosts of the rain forest"? Support your answer with information from the text.

8. Choose the word that best completes the sentence.

_____ most kangaroos live on the ground in Australia, tree kangaroos live in trees 100 feet above the ground.

A. However

B. Because

C. While

D. Before

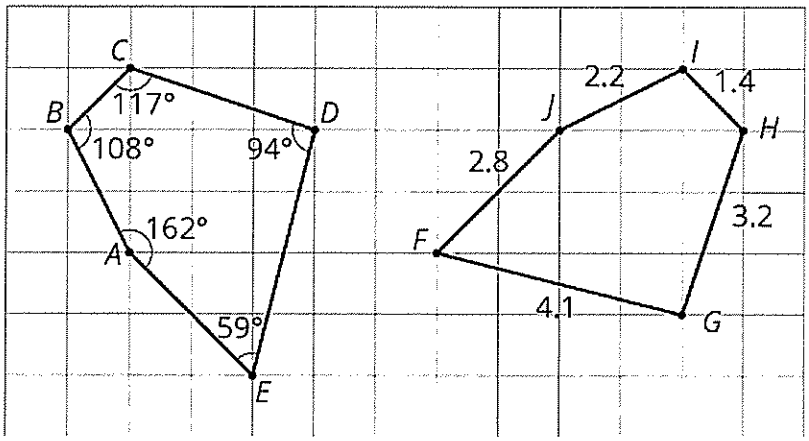
NAME DATE PERIOD

Unit 1, Lesson 12

Practice Problems

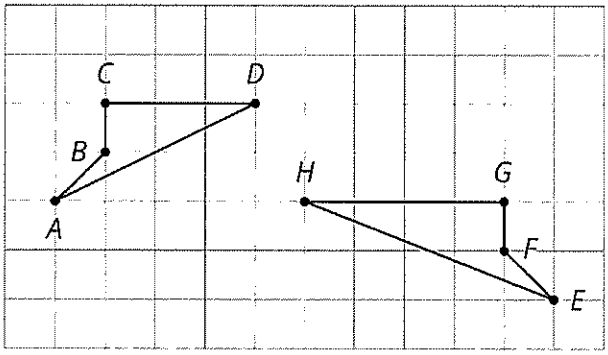
1. a. Show that the two pentagons are congruent.

   b. Find the side lengths of $ABCDE$ and the angle measures of $FGHIJ$.



2. For each pair of shapes, decide whether or not the two shapes are congruent. Explain your reasoning.

a.



NAME DATE PERIOD

Unit 1, Lesson 14

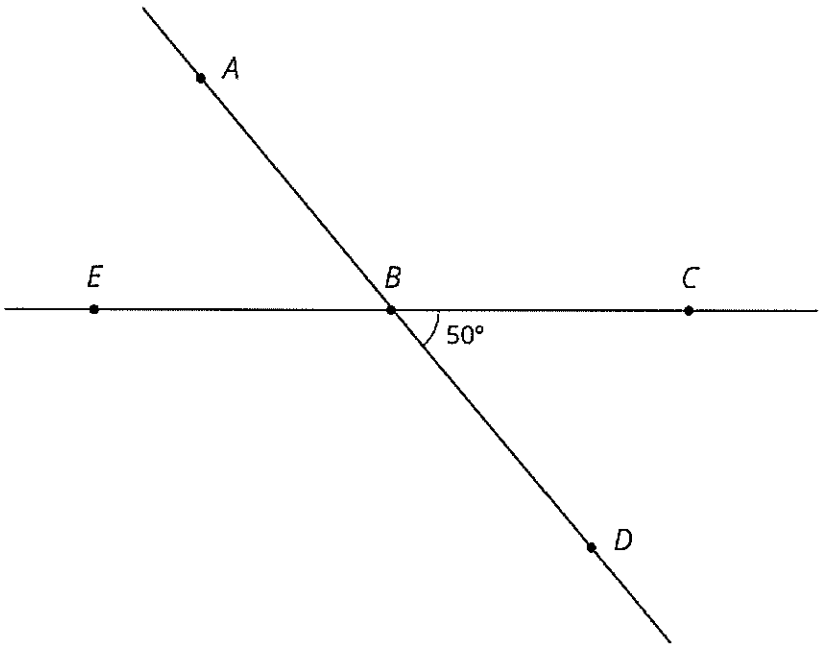
Practice Problems

1. Use the diagram to find the measures of each angle. Explain your reasoning.

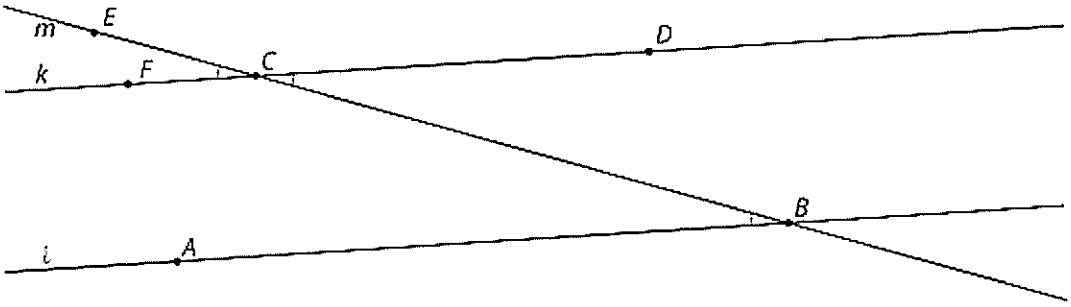
   a. $m\angle ABC$

   b. $m\angle EBD$

   c. $m\angle ABE$



2. Lines k and ℓ are parallel, and the measure of angle ABC is 19 degrees.

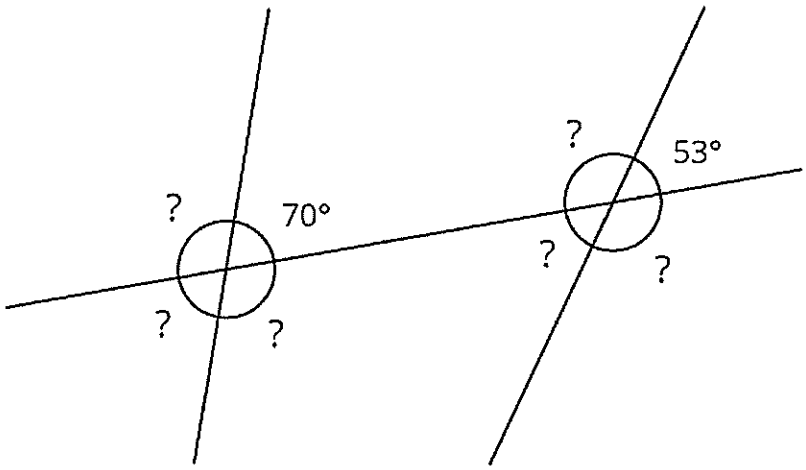


   a. Explain why the measure of angle ECF is 19 degrees. If you get stuck, consider translating line ℓ by moving B to C.

   b. What is the measure of angle BCD? Explain.

NAME DATE PERIOD

3. The diagram shows three lines with some marked angle measures.



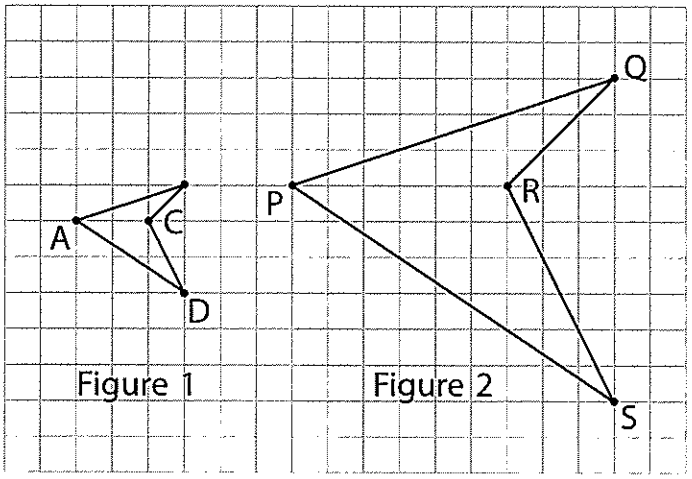
Find the missing angle measures marked with question marks.

4. The two figures are scaled copies of each other.

   a. What are some ways that you can tell they are scaled copies?

   b. What is the scale factor that takes Figure 1 to Figure 2?

   c. What is the scale factor that takes Figure 2 to Figure 1?



It's Not Easy Being Green... Or Is It?

By Michael Tinnesand

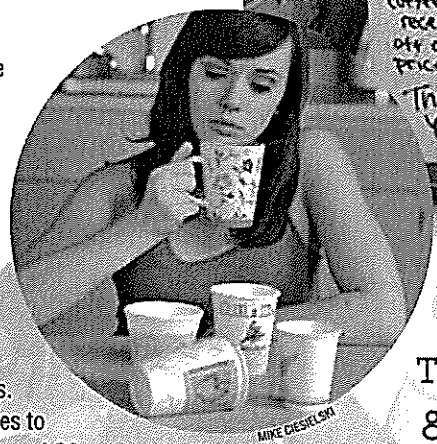
Fans await the arrival of various celebrities for a charity gala. Group after group of stars arrive in limousines or luxury sports cars. But then, what's this? One of the well-known stars at the event pulls up in a hybrid car, and soon after, another celebrity shows up in an all-electric car. People in the crowd are observing an evolution of chic—from excessive consumption to one of sustainability. ***Goodbye mink coats and Rolls Royces, say hello to the new and "greener" chic!***

But a more environmentally aware social attitude is not just about celebrity or an appealing lifestyle. It is about decisions we make and the impact those decisions have on the environment. But when we want to get a complete view of the impact a product has on the environment, we need to look at a process called **Life Cycle Analysis (LCA).** LCA examines every part of the production, use, and disposal of a product. This means looking at the collection and processing of the raw materials, the energy used in the production and use of the product, and the transportation and disposal (or recycling) costs.

MICHAEL TINNESAND

A cup of comfort

Imagine stopping by your favorite coffee shop for a hot beverage. Is it more environmentally friendly to purchase coffee in a disposable paper cup or to bring your own ceramic mug, which can be washed and reused many times? It seems like an easy decision. Bringing your own ceramic mug has to be better than a disposable paper cup, right?


MIKE CIESIELSKI

When we look a little deeper, the choice gets more complicated than it first appears. Let's start with the amount of energy it takes to produce once ceramic mug. **According to one LCA study, it takes 14 megajoules (MJ) of energy to produce one ceramic coffee cup. (A joule is a unit of energy that is equal to 2.39×10^{-4} kilocalories.)** By contrast, it only takes about 0.4 MJ of energy to produce a paper cup. (A Styrofoam cup uses only 0.2 MJ of energy.) This means that considering how much energy it takes to produce a paper cup, you would have to use a ceramic mug 35

The choice gets more complicated than it first appears.

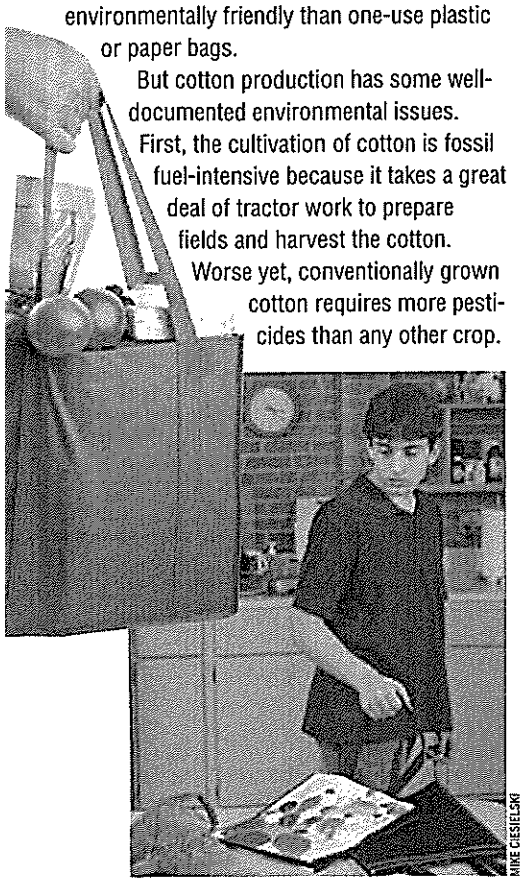
times to even out the difference in the energy to produce it over the paper cup (14MJ/35 = 0.4 MJ).

But there are other factors to consider, such as washing the ceramic mug. Even if the energy per use is decreasing every time you use the mug, you still have to add on the wash energy. Assuming the mug is washed after each use, it would take up to 1,000 uses of the mug to become less than the energy per use of a disposable cup. That would be like using the same mug every day for three years!

In the bag

What does LCA tell us about the option of "paper or plastic" at the grocery store checkout or about bringing a reusable cotton shopping bag? The obvious choice would be that a reusable cotton bag would be more environmentally friendly than one-use plastic or paper bags.

But cotton production has some well-documented environmental issues. First, the cultivation of cotton is fossil fuel-intensive because it takes a great deal of tractor work to prepare fields and harvest the cotton. Worse yet, conventionally grown cotton requires more pesticides than any other crop.



MIKE DIESELSKI

Also, the production of cotton bags releases more greenhouse gases than that of plastic bags. The production of a typical disposable plastic bag (assuming we only use it once) produces 27 grams of carbon dioxide equivalent per bag, while the production of a cotton bag releases 131 times that amount. A carbon dioxide equivalent is a quantity that describes, for a given mixture of greenhouse gases, the amount of carbon dioxide that would trap the same amount of heat as the gases present in the mixture over a specific time interval—100 years in this case.

This means that a cotton bag would have to be reused 131 times more to be a greener choice. But what about reusable bags made of polyethylene or polypropylene? These turn out to be better alternatives at only 11 times disposable plastic. Less sturdy low-density polyethylene bags are even better at 4 times. We only gain ecological advantage if we actually use our reusable bags.

PHOTOS.COM, SHUTTERSTOCK

All bottled-up

Our last example concerns another consumer choice. Should we choose a disposable plastic bottle, a glass bottle, or an aluminum can when we buy a soft drink or other beverage?

A recent study measured the total energy to produce each product, greenhouse gas emitted, and solid waste produced. The study compared the containers on the basis of global impact for the number of containers required to each hold 100,000 ounces of beverage. The results are shown in Table 1.

MIKE DIESELSKI

Product	Total Energy (BTU*)	Greenhouse Gas (pounds of carbon dioxide equivalent**)	Solid Waste (pounds)
Plastic bottle	11.0	1,125	302
Glass bottle	16.0	2,766	767
Aluminum can	26.6	4,949	4457

Table 1. Total energy, greenhouse gas emissions, and solid waste created by plastic bottles, glass bottles, and aluminum cans that would each hold 100,000 ounces of beverage. *One BTU (British Thermal Unit) is the amount of heat needed to raise one pound of water by one degree Fahrenheit. **See the main text for the definition of a carbon dioxide equivalent.

In each of the measures, the disposable plastic bottles more favorably impact the environment than either glass or aluminum containers. Glass containers are the heaviest containers of the three. This makes energy and greenhouse emissions larger for glass because heavy containers require more energy to transport and process. Aluminum is light, but the energy required for smelting and forming the aluminum containers adds to their numbers.

A note of caution

We have chosen three examples showing that selecting a more environmentally friendly item is not as obvious when the total life of the product is examined. But this is not to say that every choice for a more sustainable option is other than it seems. LCA and other environmental tools can perhaps give us a better way to make decisions about how we can best produce and consume products.

Another issue that cannot be stated strongly enough is that assessments such as LCA are complex. Trying to evaluate every factor that goes into the environmental impact of a product is complicated. For example, we may dislike the way plastic bags litter our landscape and choose to ban them for that reason. The same might be true for soft-drink containers discarded on the beach. And one sea animal killed by eating a Styrofoam cup might be one too many. So, we may be willing to bear the environmental cost of reducing our use of these products because of other ways they impact our ecosystem. It's a decision that must be made based on all available data and values.

Who knows? Maybe we are even willing to pay the price to have our celebrities keep their limousines. These decisions are all part of how we move toward a sustainable future. *CM*

SELECTED REFERENCES

Live Cycle Perspective. U.S. Environmental Protection Agency: http://www.epa.gov/nrmrl/std/lifecycle.html [accessed Dec 2013].

Life Cycle Assessment of Supermarket Carrier Bags: A Review of the Bags Available in 2006. Environment Agency's Evidence Directorate, United Kingdom: http://a0768b4a8a31e106d8b0-50dc802554e-b38a24458b98ff72d550b.r19.cf3.rackcdn.com/scho0711buan-e-e.pdf [accessed Dec 2013].

Michael Tinnesand is a science writer and education consultant who lives in Portland, Ore. His latest *ChemMatters* article, "Why Cold Doesn't Exist," appeared in the October 2013 issue.