MS. W'S CLASS- MENTOR ROOM 19

STUDENT: **CB-**- SCHOOL WORK FOR THE WEEK OF 3/16/2020

	MON	TUES	WED	THURS	FRI
ELA					
ALGEBRA					
WORLD HISTORY					
SCIENCE					
HEALTH					

COMPLETE THE ASSIGNED DAILY PACKETS TO THE BEST OF YOUR ABILITY.

Language Arts

Writing Prompts.

The following are actual writing prompts from previous English State Tests. These writing prompts will help to prepare you for any English Standardized Tests. Answer each of the prompts in **two full paragraphs**. Be sure to restate the question and to fully explain your answer. Your answers do not have to be typed, they can be hand written.

Follow All Directions!

Day 1

Blizzard Bag 1

Many students today work while they are in school. While some people cite the heightened sense of responsibility and discipline it brings to students in their academies, others believe the hours spent working interfere with the time needed for studying and doing homework. Is it an advantage or disadvantage to have a job while you are in school?

Day 2

Blizzard Bag 2

Do you think athletes should be dismissed from a team for breaking the law? Why? Why not? Support your opinion from your observations or experiences.

Day 3

Blizzard Bag 3

We live in a society of rapid and dramatic change. What are the greatest changes you have seen in the city (area) or country where you live?

Day 4 Edit All prompts

Name Day 5 Date English Class

Linking Past and Present Activity 15

Women in the Olympic Games

THEN

In the 1920s, controversy broiled in the United States over whether women should be allowed to participate in the Olympic games. Physical educators and physicians, both male and female, were opposed to female events.

Prominent male physical educator F.R. Rogers summed up the concerns of the day in his 1929 article "Olympics for Girls?" He said that pursuing one's full potential for girls meant "development of all those traits which are necessary to attract the most worthy fathers for their children, provide the most healthful physiques for child-bearing and build the most maternal emotional and social behavior patterns." He went on to say that extreme competition tended to "destroy girls' physical and psychic charm and adaptability for motherhood" and "develop wholly masculine physiques and behavior traits."

The International Olympic Committee (IOC) approved five women's track and field events for the 1928 games. After the 800-meter race, five competitors fell exhausted to the ground. While such displays occurred in men's races as well, many saw this as proof of the physical frailty of women. The *New York Times* reported that five of the "eleven wretched women" had "collapsed after reaching the tape." In 1929 a panicked IOC voted to drop women's track and field from the 1932 games. Although the IOC reversed its decision in 1930, allowing shorter races, the 800-meter was not reinstated until 1960.

NOW

In the 2000 Olympics, women competed in 22 track and field events, compared to 24 for men. In winning the heptathlon in 1988 and 1992, American Jackie Joyner-Kersee competed in seven events each time—two more than were even offered to women in 1928. One of the heptathlon's seven events is the 800-meter race, the longest women's race in 1928 at just under half a mile. Today women compete in many longer races, including the marathon—a grueling 26.2 miles.

More opportunities to compete at a high level have shown women athletes to be as mentally tough as their male counterparts. Access to weight training and better facilities has greatly increased performance, helping to dispel the stereotype of women as physically limited and in need of protection. In fact, the gap between male and female performance is narrowing. For example, the world record time for men in the 100-meter race is 9.79 seconds. Florence Griffith-Joyner, the female record holder, ran it in 10.49 seconds, less than three-fourths of a second slower.

Contrary to popular beliefs in the 1920s, exercise physiologists have established that physical activity does not harm women's reproductive functions. As today's fitness trend demonstrates, society's attitude toward women's physical activity is changing, viewing it as part of a healthy lifestyle.

CRITICAL THINKING

Directions: Answer the questions below on a separate sheet of paper.

1. **Identifying Main Ideas** What were the concerns in the 1920s over women's participation in the Olympics?
2. **Making Inferences** How might the reporting of the women's 800-meter race in 1928 have influenced public opinion of women's participation in the Olympics?
3. **Analyzing Information** What has contributed to the improved performance of today's top women athletes?

Blizzard
Bag #3
S History

Name _____ Date _____ Class _____

Reinforcing Skills Activity 16

Distinguishing Fact From Opinion

LEARNING THE SKILL

Facts can be proven by evidence such as records or historical sources. Opinions are based on people's differing values and beliefs. To help you identify facts and opinions, read or listen to the information carefully. Identify the facts. If a statement can be proven, it is factual. Identify opinions by looking for statements of beliefs, approval or disapproval, or superlatives such as *best* or *worst*.

PRACTICING THE SKILL

DIRECTIONS: Read the excerpt below about President Warren G. Harding. Then answer the questions that follow.

> Everyone who knows anything at all about American history believes that Warren G. Harding was our worst President–Harding, the affable fool from Marion, Ohio, who, after passing two utterly undistinguished terms as state senator and one as lieutenant governor, went to the U.S. Senate in 1914 and, having done little but get along with people, came out of the deadlocked 1920 Republican National Convention headed for the Presidency.
>
> His friend the politico Harry M. Daugherty had helped him get there, and in return Harding put him and his pals–the "Ohio Gang"–in a position where they could plunder the government while the trusting Harding pursued his vision of "normalcy." . . . Eventually the scandal broke, but Harding died suddenly (seventy-five years ago this August) at the end of a tour of the West in time to escape the worst of it.
>
> He has not escaped the judgment of history. In every poll–the most recent was conducted just last year–the twenty-ninth President comes at the very bottom.

1. List the facts stated in the passage. _____

2. List the opinions from the passage. _____

3. What is the purpose of this passage? _____

APPLYING THE SKILL

DIRECTIONS: Read an editorial in your local newspaper, and then answer the following questions on a separate sheet of paper.

1. List the facts stated in the editorial.
2. List the opinions from the editorial.
3. What is the purpose of the editorial?

Name _____ Date _____ Class _____

Critical Thinking Skills Activity 16 | Making Comparisons

LEARNING THE SKILL

When you *make comparisons,* you determine similarities and differences between ideas, events, or objects. Knowing how to make comparisons will help you choose among alternatives and understand historical change.

Use the following guidelines to help you make comparisons:

- Identify the items you want to compare.
- Determine common areas in which comparisons can be drawn, such as positions on an issue, reactions to an event, goals of certain groups, and so on.
- Look for similarities and differences within these areas.

PRACTICING THE SKILL

DIRECTIONS: Read the excerpt below about the state of the American automobile industry and Americans' changing perceptions of the auto in the mid-1920s. Then answer the questions that follow.

> . . . The Ford car had represented its creator's dream: a simple, durable machine that country people could use to get around and, more importantly, that they could afford (the Model T engine had been designed so that the owner could use it to run farm equipment when it wasn't propelling a car).
>
> GM [General Motors], in contrast, was interested in a different kind of consumer, a very modern consumer, one inspired not by practicality, but by speed, comfort, and styling. The company produced cars in different colors (the "T" had always been an unalterable black) and challenged customers to keep up with the times by changing models each year. While Ford stood steadfastly by his Model T, GM added new features to its cars: hydraulic brakes, chromium plating, six cylinders, and a lacquer finish. And the company convinced people to pay GM's higher prices by offering something that Ford considered immoral: the opportunity to purchase cars on installment [credit].

1. What is the topic of this excerpt?

_____

2. What similarities and differences can you find between Ford and GM automobiles in this excerpt?

_____

_____

_____

3. What similarities and differences can you find between Ford and GM customers in this excerpt?

_____

_____

_____

Day 1

For each scientist listed below, explain how they contributed to the cell theory.

Scientist	Contribution to Cell Theory
1. Robert Hooke	
2. Matthias Schleiden	
3. Theodor Schwann	
4. Rudolf Virchow	

The observations of Hooke, Schleiden, Schwann, Virchow, and others led to the development of the cell theory. The cell theory is a widely accepted explanation of the relationship between cells and living things. The cell theory states:

- **All living things or organisms are made of cells and their products.**
- **New cells are created by old cells dividing into two.**
- **Cells are the basic building units of life.**

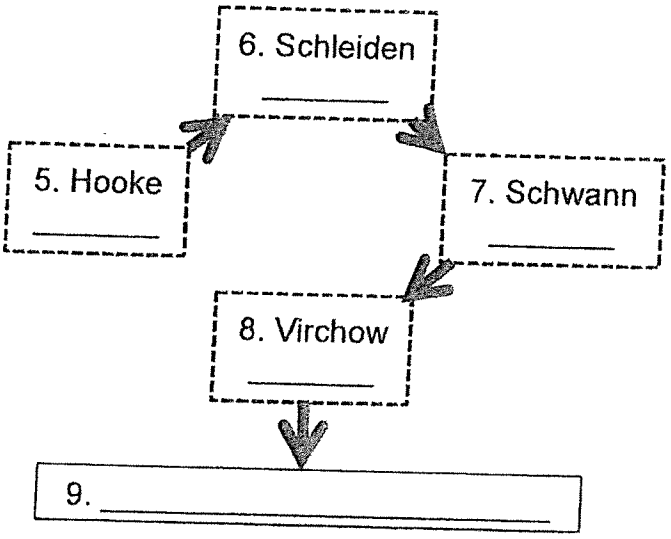
The cell theory holds true for all living things, no matter how big or small. Since cells are common to all living things, they can provide information about all life. And because all cells come from other cells, scientists can study cells to learn about growth, reproduction, and all other functions that living things perform.

Honorable Mention

Anton Van Leeuwenhoek was friends with Robert Hooke. He gets an honorable mention for the cell theory, because he expressed some interest in microscopes when they first became popular within the Renaissance men. He fashioned his own microscope and looked at many different things, including scrapings from his own teeth. That was when he saw moving particles that he called "animalcules". He shared this information with his English friend, Hooke.

Complete the diagram below by writing the letter of the statement that appropriately explains what each scientist accomplished or discovered. **For number 9, list the theory that these scientists contributed to.**

a. Concluded that cells arise from other living cells.
b. Discovered that living plant cells are comprised of cells.
c. Discovered that animals are made of cells.
d. The first person to use the word "cells" to describe the nonliving plant (cork) he observed under the microscope.



With the historical discoveries of these scientists, we have been able further classify cells into prokaryotes and eukaryotes. Prokaryotic cells make up organisms called prokaryotes. All prokaryotes are tiny and consist of single cells. Bacteria are prokaryotic cells. Eukaryotic cells make up eukaryotes. You are a eukaryote, as are plants and some types of single-celled organisms. All multicellular organisms, or organisms that have many cells, are eukaryotes.

Eukaryotic cells contain a membrane-bound nucleus, while prokaryotic cells have no nucleus at all! In eukaryotic cells, the DNA, or genetic information, is found within the nucleus. In prokaryotic cells, the DNA is found in the cytoplasm, the jellylike substance that fills both types of cells.

Analysis Questions

10. What is the smallest, most basic unit of life? _____

11. What instrument was necessary to view cells and thus establish the cell theory?

_____.

Analysis Questions

12. Why do you think that Robert Hooke used the term "cell" to describe what he saw?

_____

_____.

13. How were the discoveries of Schleiden and Schwann alike? How were they different?

_____

_____.

14. What is the cell theory?

_____

_____.

15. Why does Anton Van Leeuwenhoek get the honorable mention? _____

_____

_____.

16. Where is the DNA in a prokaryote? In a eukaryote?

_____

_____.

17. Prokaryotic cells are (circle one) bigger | smaller than eukaryotic cells.

18. A friend tells you he read somewhere that rotting garbage can turn into maggots, which are fly larvae, and the maggots then can grow into adult flies. What part of the cell theory could you use to refute his claim? _____

_____

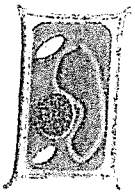
_____

_____.

Name: _____ Date: _____

The Cell Theory

As you've grown, or watched a sibling or pet grow, you have seen remarkable changes over time. Plants, animals (yourself included) grow in height and weight with each passing year. These changes result from an increase in the number and size of cells in the organism's body.

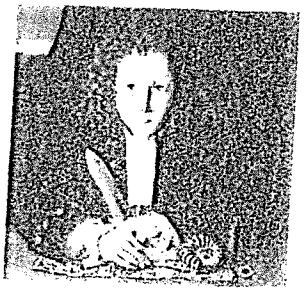


All living things are made up of basic units called cells. Your body contains trillions of cells. Your cells have their own life cycles, which means that some are dying right now, while others are brand new. Your body is constantly making new cells. In order to do this, certain materials must be supplied, and wastes must be removed. Your body takes care of itself by carrying out these processes.

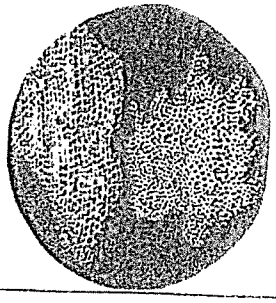
Discovery of Cells and the Cell Theory

Today we know that all organisms are made up of cells. The cell is the basic unit of structure and function in all living things. It is the smallest unit that performs all life processes, such as growth, reproduction, and metabolism. However, we did not always know that cells existed, or what they were.

Robert Hooke



In 1665, a scientist by the name of Robert Hooke used a microscope to view some slices of cork. Cork is simply a processed wood product from the bark of an oak tree. Hooke noticed that the cork was divided into thousands of tiny walled sections. He described these individual sections as "cells".



Cork cells under the microscope as Robert Hooke observed.

In 1839, nearly 200 years after Hooke's discovery, a German botanist by the name of Matthias Schleiden looked at living plant parts through a microscope. He discovered that living plants are also made up of cells. At around the same time, a German physiologist named Theodor Schwann used the microscope to view the parts of animals. He discovered that animals are also made up of cells. Shleiden and Schwann suggested that cells are found in all living things and are the basic unit of life.

Rudolf Virchow, who practiced medicine in Germany, added to the findings of Schleiden and Schwann. When studying organisms under a microscope, Virchow showed that all cells come from other living cells by viewing the stages of cell division.

Day 2

A Volcano Wakes Up

By:Kate Ramsayer

After resting for nearly 2 decades, Mount St. Helens woke up this fall. Shaking ground and a skyward blast proved to the world that it's still an active volcano.

Tiny earthquakes had been shaking the mountain for a week before it erupted on Oct. 1, 2004. The volcano spewed a gray plume of steam and ash 10,000 feet into the air. Hot magma began oozing out of the crater a few weeks later. As it kept coming, the magma literally built a small mountain in front of scientists' eyes.

Mount St. Helens on a quiet day this fall, just before it spewed steam and ash into the air on Oct. 1, 2004.
Forest Service, U.S. Department of Agriculture

These events weren't as explosive as the massive eruption that blew the top off the mountain in 1980. But the recent activity at Mount St. Helens has kept scientists busy making observations and trying to guess what comes next.

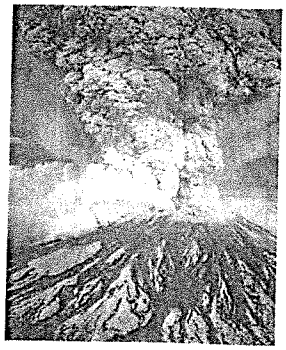
"All of us geologists are curious to see what's going to happen," says Tom Pierson. He's a research geologist with the U.S. Geological Survey.

Making a volcano

Mount St. Helens is in Washington State. It's part of the Cascade Mountain Range, which stretches from British Columbia in Canada to northern California.

Mountains in the Cascades formed where two big chunks of Earth's crust, called plates, ran into each other. When the plate under the Pacific Ocean pushed beneath the plate under North America, the incredibly high pressure and temperature caused rocks to melt into a gooey, superheated magma. The magma then seeped up through the crust. Occasionally, it reached the surface, creating volcanoes.

On the morning of May 18, 1980, Mount St. Helens demonstrated this ongoing process. The mountain erupted, sending ash more than 15 miles into the sky. The blast also went outwards, blowing out the north face of the mountain. This outburst caused massive landslides and leveled trees for miles. Lasting for 9 hours, the eruption killed fifty-seven people.



Over the next 6 years, there were some small eruptions. At times, magma seeped out of the crater, creating a lava dome. Then, except for a few minor outbursts, all was pretty quiet on Mount St. Helens for about 18 years.

Puzzling earthquakes

When a swarm of small earthquakes started up in late September, it puzzled geologists. On Mount St. Helens, earthquakes usually mean that fresh magma filled with expanding gases is pushing toward the surface, shoving rocks aside.

Scientists can detect these gases, including sulfur dioxide and carbon dioxide, using a special airplane that collects air samples. But when they made flights early this fall, the air didn't have unusual amounts of the gases.

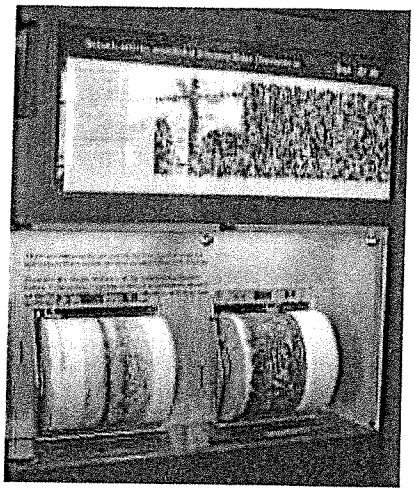
This would normally suggest that old magma was triggering the earthquakes. Like a flat soda, this magma would have already lost its gas, and the volcano probably wouldn't erupt explosively.

But the earthquakes became more frequent and stronger as time went on. Altogether, they released more energy than had been released since the 1980 eruption. This didn't fit with the old-magma hypothesis, Pierson says.

So geologists came up with a new hypothesis. Maybe fresh magma *was* causing the ruckus on Mount St. Helens. But airplanes couldn't detect any released gas because it was being absorbed by the crater's glacier.

Then seismographs, which record ground movements, detected something called a harmonic tremor. A harmonic tremor is a slow vibration of the ground. It's a bit like the rattling sound you sometimes hear when water flows through pipes, Pierson says.

This ground motion told scientists that fresh magma was definitely on the move.



"Each one of these tremor events means the magma moved a little further," says Jim Vallance. He's a research geologist with the Cascades Volcano Observatory and the U.S. Geological Survey.

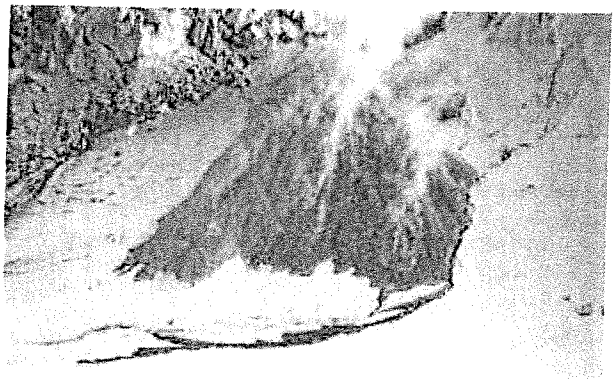
The increasing tremors and moving magma indicated that an eruption could occur within 24 hours of the first blast. On Oct. 2, scientists and park rangers with the U.S. Forest Service decided to move hundreds of volcano watchers back for safety.

"When you see a really strong tremor, it's a good time to give the volcano a little room," Bill Steele says. He's the seismic laboratory coordinator at the Pacific Northwest Seismograph Network at the University of Washington.

However, nothing happened that weekend, showing that nobody can predict exactly what a volcano might do. Since then, the mountain has released several, small plumes of steam and ash.

A new dome

Many scientists are now excited about the creation of a new lava dome in the crater of Mount St. Helens. Since mid-October, magma has been breaking through the surface at a rate of about 7 or 8 cubic yards per second.



A new lava dome is forming in the crater of Mount St. Helens.
U.S. Geological Survey

"That's like having a dump truck or cement mixer full of magma ejected every second onto the dome," Steele says. "It's pretty phenomenal." Scientists can practically watch a mountain being built right before their eyes.

Will the dome continue to grow, or will the volcano take another rest? That's the big question, says Willie Scott of the U.S. Geological Survey. There's no reliable way for geologists to predict what a volcano will do.

"All we can do is monitor it closely and see if indeed it's dying down or if it's changing its behavior," Scott says. "There's no cookbook that tells us that, if we see this, this will happen."

Scientists have several ways to keep an eye on the volcano. They can measure the gases that the volcano releases. These measurements give them clues about the magma beneath the surface.

They can use seismographs to track earthquakes, which have quieted down since the magma forged a path to the surface. Although the first eruption this fall destroyed some instruments, others have been slung into place on the crater by helicopter to measure the shaking.

Geologists can also look for changes in the shape and size of the mountain. They can look for hotspots on the crater by detecting the heat given off by the surface. They can collect rocks to study the magma itself.

Quick trips

Most of the monitoring equipment is placed in the crater by helicopter. A few times, however, scientists have made very quick trips to the crater floor to take samples or set up instruments. They don't linger, though, because they don't want to be there if the volcano erupts!

Still, scientists want to be able to detect any changes in the mountain that could signal danger. The new dome is unstable. If it collapses and clogs the magma flow, the pressure could build up and lead to an eruption. Ash in the air could cause problems for nearby airplanes. Mudslides or floodwaters from a melted glacier could harm people near the mountain.

"Any volcano surprises the people who are studying it," Pierson says. It pays to pay attention.

Name_____Date_____Period____

Question Sheet: A Volcano Wakes Up

Before reading

1. How do you think earthquakes and volcanoes are related?

2. Why can volcanoes be found in some areas of the world but not in others?

During reading

3. What happened at Mount St. Helens on May 18, 1980?

4. What gases are scientists looking for when they fly over Mount St. Helens?

5. Describe a harmonic tremor.

6. In what ways are scientists observing and studying the volcano?

7. What might happen if the new lava dome in the crater of Mount St. Helens collapses?

After reading

8. Besides volcanoes, what other natural occurrences might cause mountains to form or disappear?

9. In what ways might a volcanic eruption affect the environment?

Day 3

Name _____ Date _____ Period _____

Identifying the Controls and Variables

Scientists use an experiment to search for cause and effect relationships in nature. In other words, they design an experiment so that changes to one item cause something else to vary in a predictable way.

These changing quantities are called **variables**. A variable is any factor, trait, or condition that can exist in differing amounts or types. An experiment usually has three kinds of variables: independent, dependent, and controlled.

The **independent variable** is the one that is changed by the scientist. To insure a fair test, a good experiment has only one independent variable. As the scientist changes the independent variable, he or she observes what happens.

The scientist focuses his or her observations on the **dependent variable** to see how it responds to the change made to the independent variable. The new value of the dependent variable is caused by and depends on the value of the independent variable.

For example, if you open a faucet (the independent variable), the quantity of water flowing (dependent variable) changes in response--you observe that the water flow increases. The number of dependent variables in an experiment varies, but there is often more than one.

From Science Buddies: http://www.sciencebuddies.org/science-fair-projects/project_variables.shtml

Directions:

Read each of the following investigation scenarios and determine the independent variable and dependent variable, and state a conclusion based on the results of the experiment.

Name _____ Date _____ Period _____

1. Patrick notices that his rock is covered in a strange green slime. His friend Sponge Bob tells him that clam juice will get rid of the green slime. Patrick decides to check this out by spraying half of the rock with clam juice. He sprays the other half with water. After 3 days of "treatment" there is no change in the appearance of the green slime on either side.

A. Identify the independent variable: _____

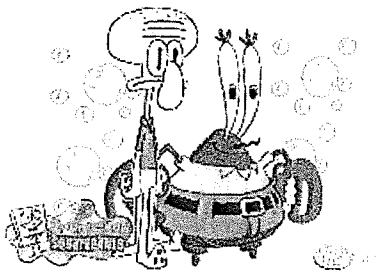
B. Identify the dependent variable: _____

C. What should Patrick's conclusion be? _____

_____

_____

2. Mr. Krabs thinks that adding a special sauce to his Krabby Patties will make the customers want to buy more Krabby Patties. He tells Sponge Bob to make 2 groups of patties: 50 with special sauce and 50 original. Mr. Krabs instructs Squidward to serve the special sauce patties to half of the restaurant and the original patties to the other half. He also tells Squidward to keep track of which customers ordered a second Krabby Pattie. After all the patties had been served 37 customers that ate the special sauce ordered a second Krabby Pattie. Only 15 customers that ate the original ordered a second Krabby Pattie.



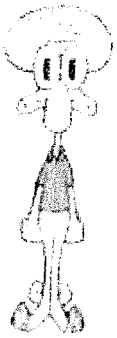
A. Identify the independent variable: _____

B. Identify the dependent variable: _____

C. What should Mr. Krabs' conclusion be? _____

_____

_____



3. Squidward has been playing his clarinet a lot lately and notices that he gets a headache after all this playing. He heard an advertisement for a new headache medicine that will relieve his headache 50% faster than his old medicine. He decides to give it a try. After playing his clarinet and getting a headache Squidward took his usual headache medicine. He timed how long it took until he felt relief – 30 minutes. The next headache Squidward got after playing the clarinet he took the new medicine. He noticed relief in only 15 minutes.

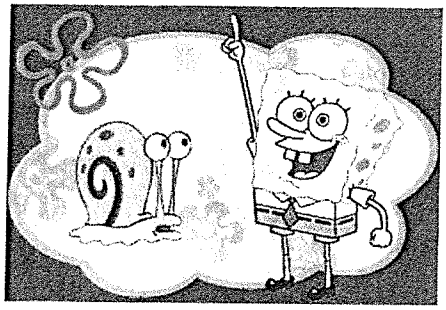
A. Identify the independent variable: _____

B. Identify the dependent variable: _____

C. What should Squidward's conclusion be? _____

_____

_____



4. Sponge Bob thinks that Gary snores too much and it keeps him awake at night. He wonders if Gary's sleeping position has anything to do with how much Gary snores. He tells Gary about his idea and Gary agrees to try sleeping in a different position. On the first night Gary sleeps in his usual horizontal position. Sponge Bob times how many minutes Gary snores. On the second night Gary sleeps vertically – stuck to the side of Sponge Bob's bed. Sponge Bob times how long he snores. On both nights Gary snored for 3 hours and 12 minutes.

A. Identify the independent variable: _____

B. Identify the dependent variable: _____

C. What should Sponge Bob's conclusion be? _____

_____

_____

Adapted from *T. Trimpe 2003 http://sciencespot.net/*

Day 4

Day 3: **Investigating Nature Near You Lab**

Pre-Lab:

Directions: Find and outdoor area to observe. Look around and find as many organisms as you can. Spend about 5 minutes looking around. Make a list below of what you found.

Lab:

Select one of the organisms from above to observe for 15 minutes. Write down an observation of the organism or the organism's environment every minute until the 15 minutes have passed. Remember an observation is something that you use your 5 senses to determine (taste, touch, see, hear, smell).

Minute	Observation
1	
2	
3	
4	
5	
6	
7	

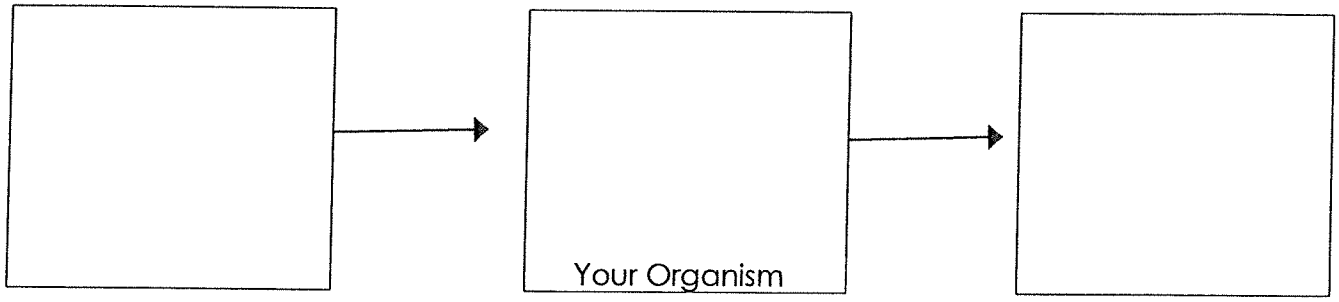
8	
9	
10	
11	
12	
13	
14	
15	

Diagram the environment the organism is in. Label the diagram.

Diagram the organism. Label colors, textures and parts of the organism.

Post-Lab: Make inferences about the organism you studied:

Make a food chain with the organism you selected:



Where wouldn't this organism live and why?

Record a list of abiotic and biotic factors present in the environment.

Abiotic: Part of an ecosystem that was *never* living. (example: rocks)

Biotic: Part of an ecosystem that is living or was living at one time.

Abiotic	Biotic

Day 5

Hubble Lives On

By Susan Gaidos / January 22, 2009

NASA has scheduled the last servicing mission for the orbiting Hubble Space Telescope. keep the space craft up and running until at least 2014.

NASA

It's been a rocky past year for the Hubble Space Telescope.

The 24,500-pound spacecraft has been racing around Earth for 18 years. Over that time, it has collected a wealth of groundbreaking data. And it has revolutionized our understanding of space.

In recent months, however, technical difficulties have plagued the historic telescope. There have been electrical malfunctions, instrument failures, downed lines of communication and more.

These problems are not all that surprising, says Frank Summers, an astronomer at the Space Telescope Science Institute in Baltimore. The Hubble has already lived longer than it was originally expected to, he says. And space is a particularly harsh environment for electronic equipment.

"Big, fancy things break," Summers says. "Those are the hazards of doing business in space."

All is not lost, however. Many of Hubble's instruments continue to send images and other data to scientists on Earth. Engineers on the ground have revived some of the telescope's compromised parts. And during a servicing mission, now planned for spring of this year, astronauts will attempt to repair what can't be fixed from here.

In the meantime, Hubble's problems highlight how important the telescope has been to astronomy in the last two decades. Scientists have used the telescope to peer into some of the most distant galaxies in the universe. It has detected moons around planets and planets around stars. It has taught scientists about black holes and dark matter. And it has taken stunning images of colliding galaxies, exploding stars, dust storms on Mars and more.

Just in the last few months, Hubble has observed two of the most massive stars in the Milky Way, watched spots move on Jupiter and given scientists insight into how stars form.

"It is arguably the best telescope in history," Summers says. "There are things we can do with Hubble that we can't do with anything else. It provides us with a birds-eye view of the universe."

Deep view

On Earth, the best place to see stars is from the top of a really tall mountain far from city lights. That's because particles in the air, like dust, debris and smog produced by cities, absorb surrounding light. Also, our atmosphere causes light from space to bend and dim as it travels to our eyes. The effect is like looking up from the bottom of a swimming pool, says Sandra Faber, an astronomer at the University of California Observatories in Santa Cruz.

Moving closer to space removes some of this distortion. That's why many of the world's biggest telescopes are built on mountaintops from Chile to Hawaii to Australia.

But moving *into* space provides the best view of all. Scientists first started sending satellites and telescopes into space in the 1950s. The Hubble launched in 1990.

The images Hubble produced were 10 times sharper than pictures astronomers could get from the ground, Faber says. No one had seen anything like it before.

"In the early days, people would crowd around computer screens and wait with bated breath for the next image to come down," Faber says.

Scientists have to apply to use the Hubble. When their time finally arrives, the wait is almost always worth it. Based on the mounds of data collected by Hubble over the years, researchers from around the world have published thousands of groundbreaking papers.

One of Hubble's greatest scientific accomplishments, Faber says, is a picture called the Hubble Ultra Deep Field. To get the image, produced in 2004, the telescope collected light for a million seconds from just one region of space. The result is a picture of what the universe looked like not long after the Big Bang. (The Big Bang was a huge explosion that sparked the start of the universe about 13.7 billion years ago.)

The Hubble has also transformed the way ordinary people view astronomy. It has taken more than a hundred thousand spectacular and colorful images of galaxies, nebulae, planets and more. The gallery includes space objects that often seem too fantastic to be real.

And the Hubble is about a lot more than just pretty pictures. A variety of instruments on the telescope collect forms of light that we can't see with our own eyes. These wavelengths reveal what stars are made of and how quickly the universe is expanding, among other types of information.

A long life

When scientists first designed the Hubble Space Telescope, they expected it to last for 15 years. In April, it will have its 19th anniversary. The spacecraft recently completed its 100,000th orbit around Earth.

One reason the Hubble has lasted so long is that astronauts have been able to go up and fix it when parts break. Repairs are common on ground telescopes. But the Hubble is the only space telescope that receives these kinds of visits, called servicing missions.

The first servicing mission was in 1993. During that trip, astronauts fixed a flaw in the telescope's main mirror. They also installed and replaced a handful of instruments.

Similar missions happened in 1997, 1999 and 2002. During these visits, scientists have been able to enhance Hubble with the latest and greatest technologies.

"Each time we add new instruments, it's like building a whole new telescope," Summers says. "We make a brand new telescope every time."

The latest servicing mission was originally planned for October 2008. Just two weeks before the scheduled shuttle launch, however, Hubble suddenly stopped sending data to Earth. The problem was traced to a device that formats and labels data sent to Earth. The device is supposed to collect information from the telescope's five main instruments and send the data to scientists on Earth.

NASA engineers are prepared for problems like these. They keep a copy of the Hubble on the ground that they practice with before doing anything to the telescope in space. And they place backups of each instrument on board.

A few days after the data formatting unit shut down, scientists were able to turn on its backup. That worked, but only for a day. Then, new troubles arose, and Hubble shut down its instruments and went into a hibernating "safe mode."

Over the next few weeks, scientists were able to turn most of the instruments back on. Hubble is now completing most if its normal operations.

One last visit

With all of the recent hiccups, the next servicing mission has been postponed until May 12, Summers says. When astronauts finally get to Hubble, they will have a small amount of time to do a lot of work. For five days, they'll have six hours a day devoted to space walks.

During that time, astronauts plan to install two new instruments: the Wide Field Camera 3 (WFC3) and the Cosmic Origins Spectrograph (COS). They'll try to repair two major

instruments: the Advanced Camera for Surveys (ACS) and the Space Telescope Imaging Spectrograph (STIS).

And they'll complete routine maintenance. Among other such tasks, they need to replace six 125-pound batteries and add new insulation to certain areas of the telescope.

"There is more planned for this servicing mission than for any other," Summers says. "If all goes as planned, Hubble will be at the peak of its powers after this mission."

No matter what happens, the next servicing mission will be Hubble's last. Scientists hope this final round of fixes will keep the telescope ticking until at least 2014.

Around that time, NASA plans to launch the James Webb Space Telescope. Similar but different from Hubble, the JWST will pick up where Hubble left off: hot on the trail of the universe's most tantalizing mysteries.

Pre-Reading

1) What do you think the purpose of the Hubble Space Telescope is?

2) Describe another type of technology used to study space.

During Reading

3) Describe three achievements of the Hubble Telescope as described in the article.

-
-
-

4) Why is the best place to look at stars on Earth on top of a mountain?

5) When was the Hubble Telescope launched?

a) 1950

b) 1960

c) 1980

d) 1990

6) How long has the Hubble Telescope been in operation? Why has it lasted longer than first expected?

7) Describe the process of how the telescope is fixed. How much time do astronauts have to repair it? What types of repairs are made?

8) How do astronauts prepare and practice to fix the telescope?

After Reading

9) What new information about space has the Hubble Telescope revealed to us?

10) Why do you think the telescope gets damaged when it is out in space? What factors can wear it down or cause it to break?

lizzard
pg #1
World
History

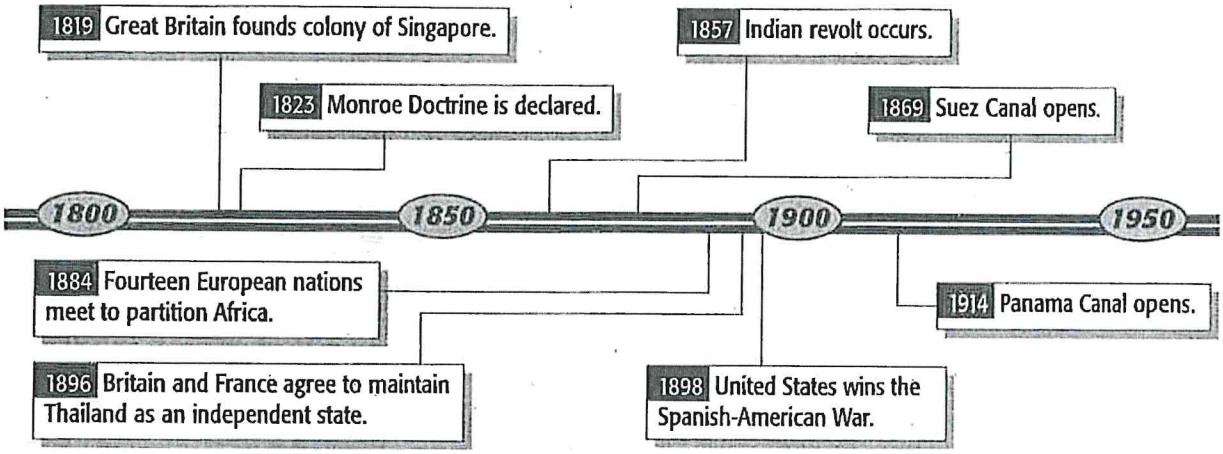
Name _____ Date DAY 1 Class 9th - 12th.

Time Line Activity 14

The Height of Imperialism

Background Nineteenth-century social, political, and economic factors led to a period of expansion called the Age of Imperialism. During this period, European countries divided Africa, India, and China among themselves, while the United States extended its power into Latin America. The time line below lists some of the key events in this period of expansion.

DIRECTIONS: Study the events shown on the time line. Then complete the chart by selecting any five events from the time line and explaining how they were examples of imperialism. First, check off which factors the event most strongly influenced: social, political, or economic. Then write a sentence justifying your choice. One event has been completed for you as a model.



Examples of Imperialism

Event	Social	Political	Economic	Explanation
Monroe Doctrine is declared.		x		**Extended U.S. interests in Latin America.**

Blizzard Bag #2 World History

Name _____ Date Day 2 Class _____

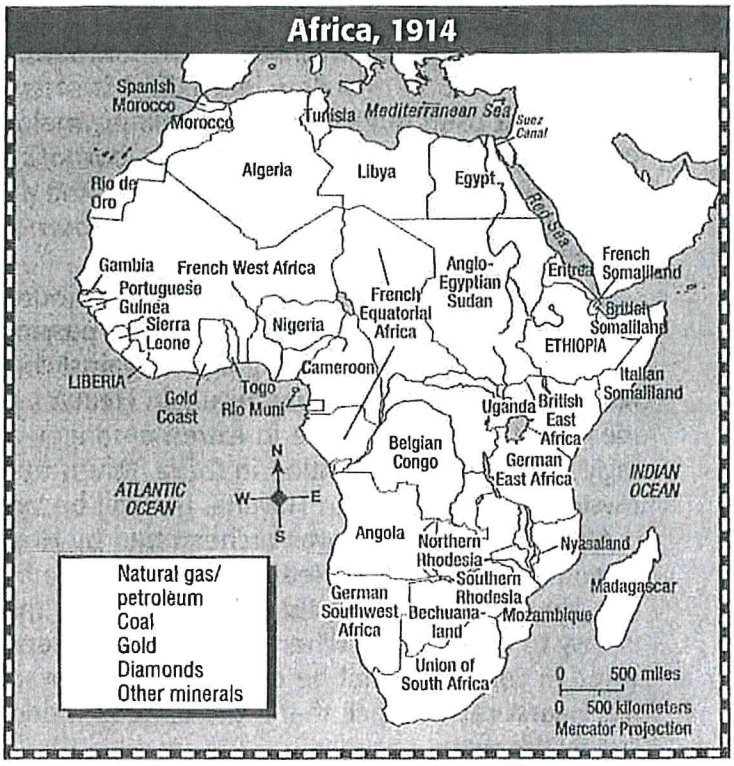
Mapping History Activity 14

Africa's Natural Resources

Many European nations sought to control the diverse natural resources of Africa. The map below shows political boundaries in Africa in 1914. The table lists the locations of many of Africa's resources. Regions with large deposits are shown in dark type.

DIRECTIONS: First, create symbols to complete the key and indicate on the map how natural resources were dispersed across the African continent. Then answer the questions that follow. Use a separate sheet of paper.

Resource(s)	Location(s)
Petroleum and Natural Gas	**Algeria, Libya,** Egypt, **Nigeria,** Angola, French Equatorial Africa (coastal region)
Coal	**Union of South Africa**
Gold	Gold Coast, Belgian Congo, **Union of South Africa**
Diamonds	Sierra Leone, German East Africa, Angola, **Union of South Africa, Belgian Congo,** Bechuanaland
Other Minerals	Morocco (lead), Gold Coast (bauxite), **Northern Rhodesia** (copper, uranium), Southern Rhodesia (copper), French West Africa (uranium), German Southwest Africa (zinc, uranium)



1. In which regions are most of Africa's petroleum and natural gas found?
2. Review the landholdings of European nations in Africa. Compare the territory claimed by France, Portugal, Great Britain, and Germany. Then rank the countries from 1 to 4 on the basis of the natural resources they controlled. Give reasons for your rankings.

Most Control of Resources

1. _____
2. _____
3. _____

Least Control of Resources

4. _____

Blizzard
Day #3
World
History

Name _____ Date Day 2 Class _____

Historical Significance Activity 13

Seeing War at the Picture Show

CHAPTER 13

On April 12, 1898, shortly after the United States declared war on Spain, a short silent film entitled "Tearing Down the Spanish Flag" began playing in American movie houses to enthusiastic audiences. In the film, a Spanish flag is shown waving. Suddenly, a hand reaches up to tear down the flag and replace it with an American flag. Although a simple film, it represented one of the first moving-picture images of war abroad.

The Age of Imperialism brought with it many violent conflicts, and, by 1898, some of these conflicts were being recorded using the new technology of film. Noting the public's interest in battle footage, film companies sent reporters around the world.

Unlike today's hand-held video cameras, early silent film cameras were bulky, mounted on tripods, required plentiful lighting, and took time to set up. With all these complications it is surprising that any films were made. However, the warring factions were sometimes surprisingly accommodating to the struggling filmmakers. W. K. L. Dickson, filming the Anglo-Boer War in Africa, was given almost unlimited access to the battlefield, which even included secret plans for military engagements so he could have sufficient time to set up and film the event! During the Mexican Revolution, the Mutual Film Corporation signed a contract with Pancho Villa, agreeing to pay the rebel leader $25,000 and a 50 percent royalty of earnings from the films in exchange for Villa's guarantee not to let any other film company's employees on the field during battles. In addition, Villa agreed to try to stage battles during daylight hours and at times convenient for the cameraman!

Filming foreign wars was costly and time-consuming. Newspapers using telegraph communication could report on events much faster than film reels could travel back by boat from the battlefield. In many cases, film companies faked news footage and substituted dramatic reenactments for the real events. For "The Battle of Santiago Bay," the filmmakers re-created the event by floating photographed cutouts of American and Spanish warships in a tub of water. Three pinches of gunpowder and a combination of cigarette and cigar smoke helped create the battle effects.

Today, video and satellite technology allow for instant recording and transmission of war events. The evening the United States declared war on Iraq, American television stations were broadcasting live from Saudia Arabia and Americans were glued to their television sets. The coverage continued daily throughout the war. The U.S. government set up a "pool system" in which a group of selected reporters and photographers, accompanied by military escorts, were permitted to visit only specified areas. All written copy, photographs, and videotapes were subject to government censorship.

DIRECTIONS: Answer the following questions on a separate sheet of paper.

1. How has media technology changed since the first news films about war were made?
2. Often during war, heated debates arise regarding the flow of information. Journalists insist that the public has a right to know what is happening, but governments argue that they have a right to restrict information or give disinformation to the press in the interests of security. With which side do you agree? Explain your opinion.
3. Video coverage of the 1991 Persian Gulf War focused on the modern technologies of warfare. Some media critics argue this focus distracts viewers from the violent consequences of war. How do you think television affects people's feelings about war?

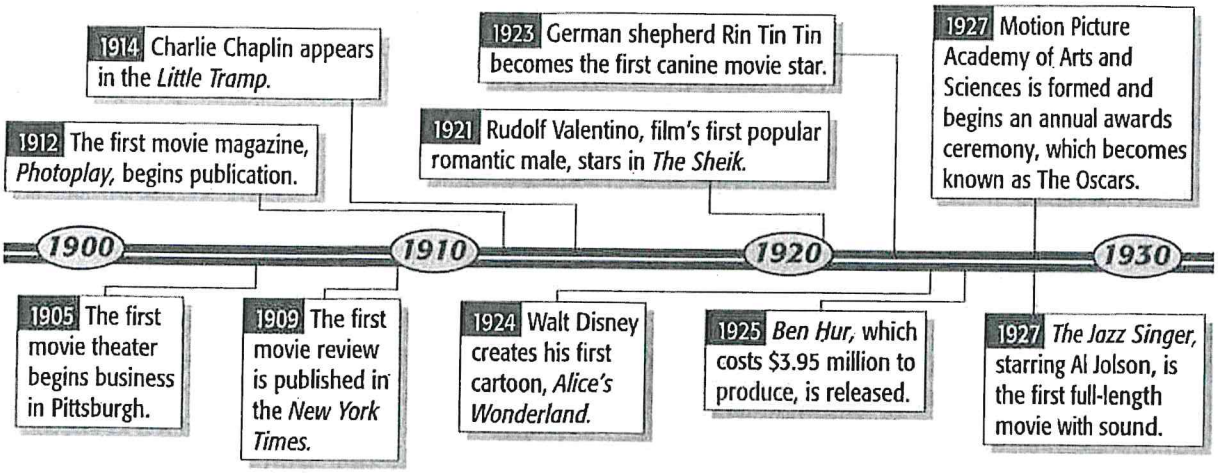
Blizzard
Bag #2
US History

Name _____ Date Day 3 Class _____

★ Time Line Activity 15

Motion Picture History

DIRECTIONS: Use the information on the time line to determine whether the sentences below are true or false. Change each false statement to make it true.



CHAPTER 15

1. True or False? In 1921 Rudolf Valentino starred in the film *The Sheik*.

_____

2. True or False? The first movie fan magazine, *Photofilm*, began publication in 1912.

_____

3. True or False? The Motion Picture Academy of Arts and Sciences was formed in 1927 and began an annual awards ceremony.

_____

4. True or False? The first movie theater opened for business in Pittsburgh in 1915.

_____

5. True or False? In 1914 Charlie Chaplin appeared in his most famous film, *Little Champ*.

_____

6. True or False? The first full-length movie with sound, *The Jazz Singer*, was released in 1926.

_____

7. True or False? Walt Disney created his first full-length movie, *Alice's Wonderland*, in 1924.

_____

8. Summerize in 1 paragraph all the information

Day 4

Name: _____

Sima Qian

The Chinese have always been fond of writing. Almost as soon as they developed their own writing system, scholars began to diligently and dutifully record everything that had been happening around them. But, by far, none had done so in a more methodical way than Sima Qian whose *Shiji* (or *Shih-chi,* literally meaning historical records) covers events spanning nearly 3,000 years. This masterpiece includes everything from the time of the mythical Yellow Emperor to the contemporary era during which Sima Qian was living. When putting the book together, Sima Qian felt that documenting everything in a long laundry list was simply not good enough. Hence, in addition to using the usual chronicle approach, he also wrote biographies for emperors as well as other important figures before his time. His new method completely revolutionized how history should be written and became the "in" style that everybody followed. For that reason alone, it is not hard to see why *Shiji* has always been hailed as one of the greatest treatises in Chinese literature!

Sima Qian was born some time between 145 B.C. and 135 B.C. His father, Sima Tan, was the Grand Historian for Emperor Wu of the Western Han dynasty for thirty years. Right from the beginning, Sima Tan had very high expectations for his son. He wanted him to inherit his post and make a name for himself. To be sure that the young boy was up for the challenge, he sent him to study with the most prominent scholars of his time. By the age of twenty, Sima Qian was already well-versed in classic literature and knew a great deal about astronomy. (In the olden days, a Grand Historian was in charge of not only jotting down pivotal turns of events, but also making astronomical observations to devise new calendars.) Shortly after he celebrated his twentieth birthday, he embarked on a journey around China. He used the occasion to visit many ancient sites and conduct field research.

Upon his return, Sima Qian was made Lang Zhong or Palace Attendant whose main duty was to inspect different parts of the country with Emperor Wu. In 110 B.C., his father fell gravely ill. Knowing that his days were numbered, Sima Tan summoned his son forward and urged him to carry out his dream of writing a comprehensive, in-depth history book for the generations to come. After he relayed this particular wish of his, the old man took his last breath and passed away. Two years later, Sima Qian inherited his father's position and became the new Grand Historian. One of his earliest accomplishments was to take part in introducing a new lunar calendar in 104 B.C. This new calendar (dubbed as " *Taichuli*") used January as the beginning of a year. (The previous version used October.) It also stated that there were 29.53 days in a month and 365.25 days in a year. At the time, *Taichuli* was the most advanced calendar that the Chinese had ever created. It remained in-force for nearly 200 years.

After rolling out *Taichuli,* Sima Qian finally had time to begin compiling *Shiji.* But just as he was getting ready to do so, an unexpected turn of events forced him to put the plan on hold; at one point, even his life was in

Name: _____ edHelper

_____ 4. Which of the following about *Shiji* is correct?

A. Its *benji* has detailed accounts about literature and custom.
B. It was published after Sima Qian passed away.
C. Its *liezhuan* is a collection of biographies for prominent rulers.
D. It consists of 130 volumes.

_____ 5. If we want to read the biography for Yellow Emperor, where can we find it in *Shiji?*

A. Shijia
B. Shu
C. Benji
D. Liezhuan

_____ 6. For how many years was Sima Qian the Grand Historian?

A. 11 years (110 B.C. - 99 B.C.)
B. 30 years (140 B.C. - 110 B.C.)
C. 9 years (108 B.C. - 99 B.C.)
D. 5 years (104 B.C. - 99 B.C.)

_____ 7. Which of the following about *Taichuli* is correct?

A. It remained in use for nearly 2,000 years.
B. It stated that there were 29.53 days in a month.
C. It was introduced in 110 B.C.
D. It used October as the beginning of a year.

_____ 8. Since very early on, Sima Qian had decided that he wanted to write a comprehensive, in-depth history book for future generations. His father did not have anything to do with that decision.

A. false
B. true

_____ 9. If we want to find the information about Xiongnu, where can we find it in *Shiji?*

A. Benji
B. Liezhuan
C. Shu
D. Shijia

_____ 10. Which of the following events happened last?

A. Emperor Wu appointed Sima Qian as Lang Zhong.
B. Sima Qian traveled around China and used the occasion to conduct field research.
C. *Taichuli* was introduced.
D. Sima Tan became the Grand Historian.

80 ÷ 8 =	5,766 + 7,891 = _____	92 - 17

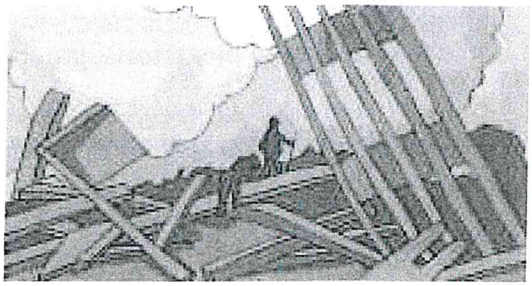
11) Summarize in 1 paragraph all the information

Name _____ Date Day 5

Wednesday, March 4

What Is Terrorism?

By Jennifer Kenny



What do you think of when you hear the word **terrorism?** Many people will think about the attacks on the World Trade Center and the Pentagon on September 11, 2001. These were horrific attacks, especially considering over 3,000 people lost their lives that day. Unfortunately, though, that is not the only terrorist attack in history. Terrorism has existed in the world for quite a long time.

What exactly is terrorism? Well, there are many different definitions out there. However, these definitions have certain things in common. Terrorism involves extraordinary violence. It is intended to create massive fear and involves a planned attack for a purpose, often against something or someone. Terrorism is meant to have an audience. The differences between various terrorist attacks involve the people, purpose, and how it is carried out.

Terrorism is a technique; it's a criminal activity and is planned in advance. For example, did you know that the bombing of the U.S. embassy in Kenya in 1998 was planned for 5 years? You can see that terrorism is an act meant to produce fear without caring about human life. The definition of terrorism used by the government of the United States refers to intimidation of civilians, the influence of government policy by coercion or fear, or trying to change the government by assassination or kidnapping.

While terrorism is meant to be an act of violence to bring about change, it is usually not committed by those officially in the government. Usually, terrorist groups have fewer members than you would think. They want to be dramatic and attract attention by carrying out a bloody act. They hope to gain power and influence because of the act.

The terrorists want to create fear so that leadership will be questioned. The terrorists want an audience, such as a rival ethnic group, a religious group, or an entire country. The terrorists want this audience to experience far-reaching fear.

Early in history there were terrorist acts that occurred for religious purposes. Often the belief was that the terrorist would receive a reward in heaven if he died carrying out the attack. The word terrorism, though, really came to be in the late 18th century during the French Revolution. This was known as the Reign of Terror. While the policy was meant to promote democracy, this way of getting rid of enemies to the government made people feel terrified. Since then, terrorism has had a negative meaning. The term terrorism was popular as well in the late 19th century when some Russian revolutionaries were struggling against the tsar's rule.

In the 1960s and 1970s, there were more ideological motivations for terrorism. Feeling the unequal distribution of wealth and power, certain groups wished to overthrow democracies, such as Italy's Red Brigades and the Weather Underground in the U.S. Other groups, such as the Irish nationalists in Northern Ireland, wished to reunite a divided nation.

We have now entered the modern age of international terrorism. Experts consider this phase as having begun on July 22, 1968. Members of the Popular Front for the Liberation of Palestine hijacked an Israeli El Al commercial plane headed from Rome to Tel Aviv. This was the first real political hijacking meant for fear and publicity.

Another major terrorist act was a domestic one. A truck bombing that killed 168 people occurred at the Alfred P. Murrah federal building in Oklahoma City.

It is easy to see that there have been many terrorist acts in history. Some are for political reasons; some are for economic reasons, and some are for religious ones. There have been very specific terrorist acts from antinuclear energy, environmental and animal rights groups, too. While these may not have the same death toll as the September 11th tragedy, they are still considered acts of terrorism. For example, some radical animal rights

Name _____ Date _____

Wednesday, March 4

_____ 5. Which is considered the beginning of the modern age of international terrorism?

A. attacks of September 11, 2001
B. Reign of Terror
C. Oklahoma City bombing
D. hijacking of plane on July 22, 1968

_____ 6. If an animal rights activist attacks a lab to protest the use of animals in medical experiments, would that be considered a terrorist attack?

A. no
B. yes

_____ 7. Which has not increased the deadliness of terrorism?

A. increase of suicide attacks
B. access to weapons
C. religiously motivated acts
D. attempts at peacemaking

What are the challenges facing experts who are trying to prevent terrorism?

WEEK Day 1-5

LESSON 1.1

Name _____ Date _____

Practice

For use with pages 5–9

Evaluate the expression when $y = 6$.

1. $\frac{24}{y}$ **2.** $5y$ **3.** $20 - y$ **4.** $19 + y$

5. $y + 13$ **6.** $54 - y$ **7.** $7y$ **8.** $\frac{36}{y}$

Evaluate the expression when $m = 7$, $n = 9$, and $q = 10$.

9. nq **10.** $\frac{18}{n}$ **11.** $m + q$ **12.** $29 - m$

13. $58 - m$ **14.** $41 + n$ **15.** $16q$ **16.** $\frac{36}{n}$

17. You are dividing 130 students into g equally sized groups for a field trip. Write a variable expression to find the number of students in each group.

Write a variable expression to represent the phrase.

18. A number added to 27

19. 29 decreased by a number

20. 6 fewer than a number

21. The sum of 16 and a number

22. The product of a number and 7

23. 42 divided by a number

24. The quotient of 56 and a number

25. A number multiplied by 12

In Exercises 26–29, use the following information. You belong to a book club. Your yearly book budget is $350. Each book in the book club costs $7.

26. Complete the table.

Books	Cost (dollars)	Amount left (dollars)
1	7	343
2	14	336
3	?	?
4	?	?

27. Write a variable expression for the cost of b books.

28. Write a variable expression for the amount of your budget after b books.

29. How many books will you be able to buy before the $350 is spent?

LESSON 1.3

Name _____ Date _____

Practice

For use with pages 16–21

Evaluate the expression.

1. $6.1(4) + 2(1.5)$

2. $58.4 - 4(9.2)$

3. $\frac{2.6 + 3.9}{7.8 - 7.3}$

4. $\frac{42 - 17}{0.2(25)}$

5. $7(16 - 2^3)$

6. $9(3 + 5^3)$

7. $2.5[10 + (20 - 2^2)]$

8. $3.1[100 - (5^2 \cdot 3)]$

9. $90 \div [(82 - 77) \cdot 9]$

10. Find the sum of 2 cubed and 3 squared.

11. Find the difference of 10 squared and 9 squared.

Evaluate the expression when $a = 16$, $b = 8$, and $c = 7$.

12. $8c \div 4$

13. $(c + 5) \div 6$

14. $3a + 2.1(4)$

15. $\frac{2a}{15 - c}$

16. $7.2b - bc$

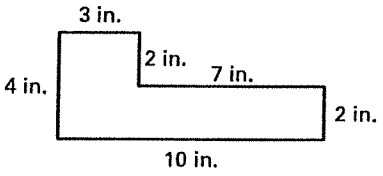
17. $b(a - 9.1)$

18. $ac[(99 - b^2) \cdot 2]$

19. $c^3[4.1(3c - 19)]$

20. $\frac{b^3(9 - 5.9)}{3.2(20.4 - 12.4)}$

21. The formula to find the area A of a rectangle is $A = \ell w$, where ℓ is the length of the rectangle and w is the width of the rectangle. The figure below can be divided into two rectangles. Find the total area of the figure.



22. You complete a project for your social studies class. There are 3 parts to the project, worth a total of 100 points. You get 50 out of 50 points on part A, and 23 out of 25 points on part C. The total score you received is 93 out of 100. How many points did you get on part B?

23. You use a long distance telephone service that charges \$.99 for the first minute of a long distance call and \$.10 for each additional minute. Write and evaluate an expression for the total cost of a 17-minute long distance phone call.

LESSON 1.5

Name _____ Date _____

Practice

For use with pages 28–33

Tell whether the sum is positive or negative. You do not need to find the sum.

1. $-27 + (-16)$

2. $-18 + 75$

Use a number line to find the sum.

3. $-15 + (-4)$

4. $-21 + (-5)$

5. $-6 + 35$

6. $-42 + 10$

7. $11 + (-47)$

8. $9 + (-53)$

9. $-106 + (-3)$

10. $-94 + (-1)$

11. $81 + (-7)$

Find the sum.

12. $-41 + 30$

13. $-15 + 27$

14. $-21 + (-34)$

15. $-51 + (-23)$

16. $61 + (-33)$

17. $29 + (-48)$

18. $64 + (-17)$

19. $91 + (-26)$

20. $-46 + (-75)$

21. $-9 + 12 + (-4)$

22. $-22 + (-13) + 6$

23. $55 + (-26) + 47$

Evaluate the expression when $a = 8$ and $b = -14$.

24. $a + (-23)$

25. $-a + b$

26. $-72 + b$

27. $b + 39$

28. $a + (-b)$

29. $-61 + a$

30. The temperature at 6 A.M. is $-10°$ Fahrenheit. During the day, the temperature rises 6°F, drops 3°F, rises 2°F, and drops 8°F. Write an integer to represent each value. What is the temperature after these changes?

31. The table shows incomes and expenses for a small music store in one week. Write an integer to represent each value. Then find the net profit for the week.

Income	Expense
Instruments $800	Displays $110
Sheet music $100	Salaries $400
Lessons $150	

#1 Assignment for all Life Skills classes (Nutrition & Wellness, Child Development, Personal Wellness): Complete 1 wellness journal entry (front and back). You may print this page, or list the info on your own paper, and complete. Turn in completed entry (front and back) to Mrs. Sonnenberg.

Health. WEEK 1

Wellness Journal Entry

Name: Class Period:

Date:

List all Food/Drinks in Past 24 hours (include amounts):

Example: 1 cheeseburger with ketchup, pickles 1 can Diet Pepsi

List all exercise in past 24 hours (include length of time):

Ran 2 miles (20 minutes)

List number of hours of sleep last night:

Extended Response Question:

Wellness means to "reach for your personal overall best level of health." What is a goal that you could wo towards today to improve your wellness? Explain the goal, describe what you could do to achieve that go and evaluate your progress.

WEEK 2 Day 1-5 World History

OGT Coverage: PS.C.9.3.a, b, c, d, e, f, g

LESSON 10

Cultural Exchange

① READ Packet.
② Complete All Quick Reviews
③ OGT Practice Complete.

IT'S IMPORTANT:

- People from different cultures exchange cultural practices for a variety of reasons and in a variety of ways.
- Advances in communication and transportation have had an impact on globalization, cooperation and conflict, the environment, collective security, popular culture, political systems and religion.

The world has become smaller through mass communication and the ability to travel huge distances in a matter of hours. Because of this, the cultures of the world are more interconnected than ever before. Jet airplanes, high-speed trains, easy access to automobiles and advances in shipping practices have brought people from different cultures into ever closer contact. The Internet has connected us to a truly worldwide web of individuals. We come into contact with people who may share many of our interests, tastes and concerns, but who also have their own unique cultural practices. Cable and satellite television has allowed people from many different cultures to experience and exchange information about news, sports, art, language, education, politics, religion, the environment—and the list goes on.

In this lesson, you will learn how some of these technological advances have influenced the way people live, work and relate to each other.

Globalization

Globalization is a term that covers a lot in one word. It refers to the way the world's countries are increasingly interdependent on one another. This interdependence is largely economic. Goods, services and money flow across international borders as never before. Much of this flow is due to improvements in technology. As you will read in the following sections, transportation and communication improvements have been extremely important to the growth of globalization. Transportation technology carries things from place to place. Communication technology contributes to the flow of information across borders. When you can log onto the Internet to buy and download songs by a band from Sweden, that's globalization right in your own home. The flow of information also makes it possible for corporations to do business wherever and however they want. International investors can put their money to work anywhere, regardless of national borders.

In the industrial world, people have always moved to where the jobs are. This is still true to some extent today. However, in the global economy, jobs often move to where the people are. For example, American companies have moved some of their factories to Mexico or China, where people will work for less money. Even some high-tech jobs have been moved, or outsourced, to foreign countries. When you call a software company for technical support, you may be speaking to someone sitting in India. (This is another way in which communications improvements drive globalization.)

Critics of globalization say that it makes the world run by the rules of the richest countries. However, those who favor globalization say that participation in a global economy allows poorer countries their best chance to compete.

Quick Review 1: Globalization has changed the world economically and socially in the last 20 to 25 years. Which of the following statements best describes the changes brought about by globalization?

A. Globalization has given poorer countries an advantage over richer ones.

B. Globalization has led to the outsourcing of jobs from countries such as China to the United States.

C. Globalization has created a worldwide market for money, goods, services and information.

D. Globalization is responsible for the creation of the Internet as a method of delivering news and entertainment.

Transportation

Transportation improvements have made it possible for products to be manufactured far away from where they are used. Transportation has also affected the environment, leading to both conflict and cooperation between people and nations. From the steam engine to the jet engine, the process of globalization has been accelerated by advances in transportation.

TARIFFS, TRADE AND NAFTA

Countries used to place tariffs on imported goods. A tariff is a tax that raises the price of goods. When a tariff makes a foreign product more expensive, the same product made in the home country is more attractive to buy. In the 1990s, however, many of the world's countries lowered their tariffs or dropped them altogether. Free trade produces open markets in which all countries may participate on an equal basis. The North American Free Trade Agreement (NAFTA) between the United States, Canada and Mexico went into effect in 1994. NAFTA was intended to make North America into one big market, leading to lower prices for goods and higher profits for companies and countries, which in turn was supposed to lead to higher wages for workers. NAFTA has lived up to its promises in some ways, but not in others. Nevertheless, other NAFTA-style agreements are being proposed in other regions of the world. Free trade and open markets are important to the globalization of the economy.

OGT Coverage: PS.C.9.3.a, b, c, d, e, f, g

The internal combustion engine

As you learned in Lesson 2, the steam engine changed industry, transportation and the environment all over the world in the 19th century. The average person, however, still walked to the market or rode a horse to the next town. Moving belongings from place to place required a horse-drawn cart. Steam engines were too large to drive wagons or small carts. They also needed a separate firebox to generate the heat to make steam.

The **internal combustion engine**, which produces power from fuel burned inside the engine itself, made the automobile possible. In turn, the automobile made it possible for the average person or family to go where they wanted, when they wanted. Workers no longer needed to live near factories or office buildings. They could move to any town within driving distance. Travel habits changed, too. Families drove instead of taking the train. Gas stations, restaurants and other tourist services sprouted along newly built highways.

One of the most serious effects of the automobile, however, has been environmental. Pollution caused by car and truck exhaust has made the air in places such as Los Angeles, California, and Mexico City, Mexico, dangerous to breathe. Road construction has destroyed sensitive wilderness. The commercial and residential development that follows road-building has destroyed even more.

Engines of war

In addition to its use in the automobile, the internal combustion engine was widely used for the first time during World War I. The use of trucks, planes and tanks changed the way war was waged. Motorized warfare increased the number of casualties and the destruction of property.

Use of vehicles in war also made quick surprise attacks much more likely. For example, the beginning of World War II would have been much different if Germany's troops had invaded Poland on horseback or on foot. Poland's army was well-trained. They would have known the Germans were coming. Instead, German planes and tanks took the war deep into Poland in just a few hours. Polish troops were defeated before they could mount a defense.

With the constant threat of sudden attack, the nations of the world entered an era of **collective security**. Collective security is a strategy under which a group of nations agree not to attack each other. They also agree to defend each other against an attack from one of the others. NATO (North Atlantic Treaty Organization) is an example of a collective security organization. The United Nations is another. With so many advances in military transportation and delivery systems over the past few decades, the role of collective security has become increasingly important for international cooperation and stability.

KEEP ON TRUCKIN'

Rudolf Diesel, a German engineer, wanted to make a heavy-duty engine that would allow small craftsmen to compete with large factories (which had huge steam engines). Diesel invented an internal-combustion engine that didn't need a spark to ignite the fuel (gasoline engines have spark plugs). Instead, his engine compressed air until it got so hot it burned the fuel. These engines used less fuel than gasoline engines, they could pull or lift much more weight than gasoline engines and the fuel was less expensive than gasoline.

Instead of changing the small shops of craftsmen, however, the **diesel engine** revolutionized large-scale transportation. Many trucks, railroad locomotives and ships (including submarines) still use diesel power.

OGT Coverage: PS.C.9.3.a, b, c, d, e, f, g

Quick Review 2: The internal combustion engine affected transportation. Changes in transportation affected the way wars were fought. How did the internal combustion engine affect World War I?

A. It allowed attackers to move faster and permitted Germany to defeat Poland more easily.

B. More mobile weapons led to greater numbers of casualties and more property damage.

C. It improved the collective security of nations using motorized transportation.

D. Motorized transportation was less expensive than other forms of transportation.

The jet engine

One of the most influential advances for both the military and civilians was the invention of the **turbo-jet engine** in 1939. At first, the jet engine was used mostly in military fighter aircraft, but commercial airlines began jet-powered transatlantic service in 1958. Jets allowed many more people to travel to different continents and experience other cultures.

Jet engines also paved the way for rocket-powered space travel and the Cold War era "space race" between the United States and the Soviet Union. When the Soviet Union launched the world's first satellite, Sputnik I, into orbit around Earth in 1957, the United States worried about what kind of advantage this gave the Soviets over America. The United States feared that the Soviet Union might use satellites to spy on America, or even to deploy missiles. Because of these fears, the United States quickly responded by developing its own space program. The United States put the first man on the moon in 1969. The competition spawned by the jet engine was as much political as it was technological.

Since the end of the Cold War, however, the space race has been gradually replaced by increasing cooperation among nations that now share research and satellites.

SPACE TRAVEL AND POPULAR CULTURE

Space exploration fed the popular imagination and became a cultural symbol of the 1960s. Television and radio news often talked about space exploration, and advertisers used images and sounds of aliens and space suits to sell their products. Themes about space could be found in comic books, movies, music and television series. In Britain, the science fiction series *Dr. Who* became popular; in the United States, television viewers first watched *Star Trek* in 1966. Movies such as *Planet of the Apes* (1968) and *2001: A Space Odyssey* (1968) were huge box-office hits.

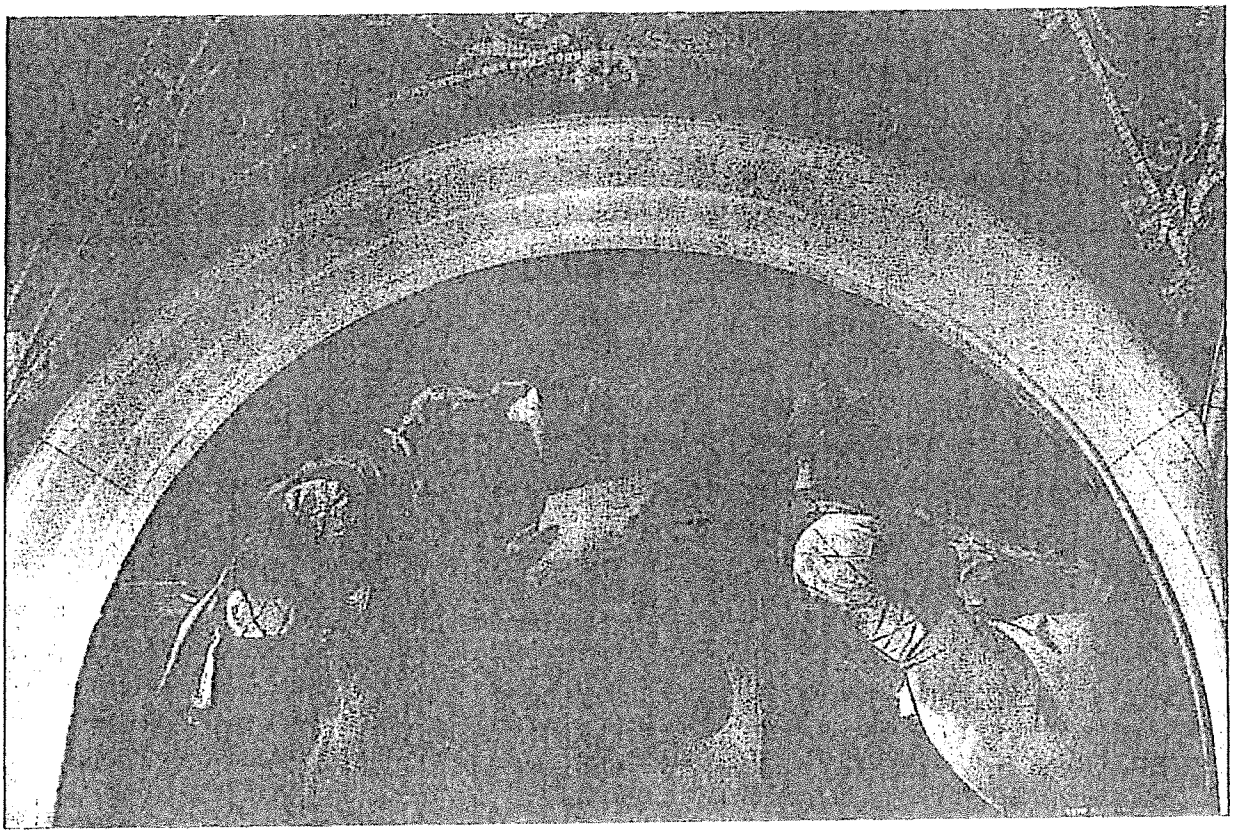
Quick Review 3: Imagine that a historian says, "The jet engine helped contribute to Cold War tensions between the United States and the Soviet Union." Explain why the historian's comment is correct.

OGT Coverage: PS.C.9.3.a, b, c, d, e, f, g

From the Printing Press to the Internet

Johannes Gutenberg was a 15th-century German goldsmith and craftsman who spent more than 17 years, most of it in secret, inventing the printing press. Before Gutenberg, books were copied by hand for monasteries or for wealthy nobles. These handmade books were beautiful but expensive. They also often contained errors made by scribes (the men who did the actual copying). Around 1455, Gutenberg printed his three-volume Latin Bible. About 40 copies of this first modern book still exist.

Gutenberg did not set out to invent mass publishing, however. He wanted to find a more convenient way to produce books for the Church that kept the beauty of the older, handmade versions. (His Bible even looked like the work of a scribe.) Instead, he invented the printing process that would be used until the 20th century. It would help bring the written word to millions of people. By doing so, the printing press helped pave the way to the Renaissance, the Enlightenment and modern mass education.



Above: *Gutenberg's printing press used movable type, consisting of small pieces of metal each engraved with a letter. He greatly improved the speed and efficiency of the printing process by developing a system to mass-produce movable type.*

Quick Review 4: How did Gutenberg's press affect the course of history?

A. By making it easier for monks to print books, it kept books in the monasteries.

B. The printing press was condemned by the Roman Catholic Church and had little effect outside Germany.

C. The printing press helped preserve the art of making and copying books by hand.

D. Books became accessible to millions of readers, which helped to spread knowledge.

Communications advances

Today, we can see pictures and live video from distant parts of the world on our TV sets or computers. We take that for granted now, but it wasn't always true. In 1963, when President Kennedy was assassinated in Dallas, Texas, film of events in the city had to be flown from Texas to TV studios in New York for broadcast. There was no other way to send video from place to place—but that was already changing. The previous year, 1962, the first communications satellite, *Telstar I*, had been launched into orbit around Earth. It was the beginning of the Information Age, a time of great leaps in technology that would directly affect millions of people.

Satellite broadcasting of news, sports and entertainment continues to change the way people see the world. Informational borders that were once tightly controlled in some nations are bypassed by people who have access to cable or satellite television and the Internet. The news coverage of the fall of the Berlin Wall and the resulting fall of communism in the rest of Eastern Europe was watched live by much of the world. Many believe that this instantaneous global news actually helped end the Cold War by inspiring people in Eastern Europe with images of mass protest in neighboring countries. Similarly, the 1991 Persian Gulf War and the Iraq War that began in 2003 were seen live, while they were happening.

The technology that sends pictures into our homes is only part of the story. Having a way to see the pictures is also important. Until 1980, there was relatively little time devoted to news on TV. Stations broadcast short news programs, mostly in the morning and evening, along with regular entertainment shows. In 1980, the Cable News Network (CNN) went on the air broadcasting news 24 hours a day, seven days a week. It showed live pictures of the Berlin Wall falling. CNN reporters were on the air live from Baghdad during the first air attacks of the Gulf War in 1991. Other 24-hour news channels, MSNBC and Fox News Channel, both went on the air in 1996. When the Iraq War began in 2003, military leaders permitted TV, radio and print reporters to accompany soldiers on missions. Viewers, listeners and readers got a closer view of war than ever before in history.

Not only has improved mass communication lessened the isolation of developing nations, it has also increased cultural awareness. It has contributed to globalization by helping people exchange cultural practices and products. People can learn about life in other cultures simply by watching television programs or movies (or visiting websites) from around the world.

OGT Coverage: PS.C.9.3.a, b, c, d, e, f, g

TECHNOLOGY AND RELIGION

The invention of the printing press had a huge impact on religion, especially Christianity and Judaism. It allowed people to read for the first time the Christian Bible and the Jewish text of religious studies, the Zohar, on their own. The printing press also contributed to the Reformation, the religious movement that broke away from Roman Catholicism and established the Protestant churches.

In the 20th century, radio and television changed the way religious thought and beliefs were communicated. In the United States, **televangelism** helped spread conservative Protestant beliefs to increasingly larger audiences. Beginning in the 1950s with a traditional format of church services usually restricted to Sunday mornings, televangelism today has 24-hour cable broadcasting with a wide range of formats, including news, entertainment and religious talk shows.

With the popularization of the Internet, online religion has reached even larger audiences. One of the biggest impacts is the Internet's ability to present a wide diversity of religious beliefs and practices. Every major religion has a site on the World Wide Web. The reading of religious texts such as the Torah, the Qur'an and the Bible has been made even more accessible through the innovation of electronic texts. The Internet has also inspired new religious activities, such as online prayer rooms that provide virtual holy sites for millions of people.

The globalization of the Internet

Although there was an Internet before 1993, most users were computer scientists and programmers in government, military and academic computer labs. Other types of scientists used the Internet as well. They could send e-mail to colleagues and run programs on computers across the country or around the world. The Internet of the 1970s and 1980s was difficult to use. Users had to know information about the computers to which they wished to connect, how to establish that connection and how to send their information.

In 1991, **Tim Berners-Lee**, a programmer at CERN, the European Center for Nuclear Research in Geneva, Switzerland, wrote the first **World Wide Web** program. His program allowed hundreds of scientists working on the same project to look at pages of notes, papers and simple diagrams on their computers. The program, which Berners-Lee called a "**browser**," took care of connecting the scientist's computer to the computers where the pages were located. The browser also determined how to display the pages, no matter what program had been used to make them. These early pages had "links" to click on, just as web pages do today.

In 1993, graduate students at the University of Illinois released the first browser that looks like the ones we use today. At first, only university professors, students and others who used the Internet for research used the browser. Soon, however, museums, libraries, newspapers and other institutions that owned information made that information accessible through web browsers. Businesses soon followed, and by the late 1990s the Internet was a place for recreation, learning, buying and selling.

With increasingly sophisticated software and browsers, companies were able to learn a lot about their Internet customers. They could then tailor their goods, production and marketing to appeal to individual tastes. Consumers were able to compare products and prices while sitting at their desks. It took minutes to make a purchase that previously might have taken a day or two driving from store to store. Internet commerce is dominated by large companies. However, it is possible for someone using the web in India to purchase custom-built furniture from a cabinetmaker in Maine. In addition, companies can keep more up-to-date records regarding the manufacture and sale of products by using the Internet.

Businesses also use the Internet to make many tasks of business operation easier. Electronic communication has made it easier for people in business to communicate. Using the Internet, it is possible for people in India to "attend" a meeting with people at an office in the United States. This is another way in which the Internet makes the world seem smaller. It permits more efficient operation of business because people no longer need to be located in the same place to work together.

Computer technology also contributes to the dissolving of barriers between people and nations. E-mail and the World Wide Web give up-to-the-minute information and access to capital needed for some global business ventures. In addition, Internet chat rooms and bulletin boards can connect people half a world apart.

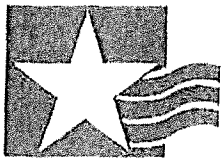
Quick Review 5: How does the Internet contribute to the globalization of business?

A. by making it easier to sell goods and send or receive information over long distances

B. by making it possible for people to read documents for themselves

C. by requiring complicated computer programs that only large businesses can afford to create

D. by requiring scientists to keep improving the Internet so more people can use it



OGT Practice

1. Collective security agreements between countries have become more important as transportation technology has improved. Why has improved transportation made these agreements more important? In your answer, explain how such agreements protect countries. Write your answer on the lines below. (2 points)

2. Which of the following events began the space race between the United States and the Soviet Union?

   A. the *Apollo 11* mission to the moon

   B. the launching of the satellite *Sputnik I*

   C. the beginning of the Cold War

   D. the release of the film *2001: A Space Odyssey*

3. The Internet was not widely used until the mid-1990s. However, its origins go back to the 1960s. Which group used the Internet the most during its earliest years?

   A. scientists

   B. school teachers

   C. businesspeople

   D. religious leaders

4. Communist governments in Eastern Europe rapidly fell during the late 1980s and early 1990s. Some historians claim that it couldn't have happened without the assistance of certain types of technology. Which of the following technological improvements is believed to have been a major factor in the fall of Communism in Eastern Europe?

   A. the Internet, because it permitted people in Communist countries to communicate and organize

   B. the printing press, because it made the spreading of knowledge easier than at any previous time in history

   C. satellite broadcasting, because it allowed people to see what was happening in other countries as it happened

   D. the internal combustion engine, because it gave people a way to escape from their Communist governments

5. In the early years of the Internet, American economist Paul Samuelson said, "Sooner or later the Internet will become profitable. It's an old story played before by canals, railroads and automobiles." Over the last 10 years, Samuelson's statement has proven true for many businesses around the world. Name and briefly explain two ways in which the Internet has contributed to the globalization of business. Write your answer on the lines below. (4 points)

MS. W'S CLASS- **MENTOR** **ROOM 19**

STUDENT: **CB-**- SCHOOL WORK FOR THE WEEK OF 3/30/2020

	MON	TUES	WED	THURS	FRI
ELA					
ALGEBRA					
WORLD HISTORY					
SCIENCE					
HEALTH					

COMPLETE THE ASSIGNED DAILY PACKETS TO THE BEST OF YOUR ABILITY.

Name _____ Class _____ Date _____

Science WEEK 2 Day #1

CHAPTER 18 Electromagnetism

SECTION 1

Magnets and Magnetism

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What are the properties of magnets?
- Why are only some materials magnetic?
- What are four kinds of magnets?
- What are two examples of the effect of the Earth's magnetic field?

National Science Education Standards

PS 3a

What Are the Properties of Magnets?

Have you ever experimented with magnets? If so, you know that they can stick to each other and to some kinds of metal. You also know that magnets can stick to things without touching them directly. For example, a magnet sticks to a refrigerator door even with a piece of paper in between. They are not really sticky, so what makes things cling to them?

More than 2,000 years ago, the Greeks discovered a mineral that attracted things made of iron. They found it in a part of Turkey called Magnesia, so the Greeks called it *magnetite*. Today, we call any material that attracts iron or things made of iron a **magnet**. All magnets have certain properties. For example, all magnets have two poles. Magnets exert forces on each other. Last, all magnets are surrounded by magnetic fields. ☑

STUDY TIP

Predict Before reading this section, predict whether each of the following statements is true or false:

- Every magnet has a north pole and a south pole.
- The magnetic pole near the Earth's South Pole is a north pole.

READING CHECK

1. List What are three properties of a magnet?

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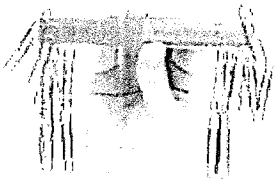
MAGNETIC POLES



More paper clips stick to the ends, or magnetic poles, of the magnet because the magnetic forces are strongest there.

Magnetic effects are not the same throughout the magnet. What happens when you put a bar magnet into a box of paper clips? Most of the clips stick to the ends of the magnet. The strongest magnetic forces occur near the ends of the bar magnet. Each end of the magnet is a magnetic pole. **Magnetic poles** are points on a magnet that have opposite magnetic qualities. ☑

READING CHECK

2. Describe What are magnetic poles?

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NORTH AND SOUTH

Suppose you hang a magnet by a string so that the magnet can rotate. You will see that one end of the magnet always points toward north. A compass is a suspended magnet. The pole of the magnet that points toward north is called the magnet's *north pole.* The opposite end of the magnet points toward south. It is called the magnet's *south pole.* Magnetic poles are always in pairs. You will never find a magnet that has only one pole. ☑

READING CHECK

3. Identify What is the name of a magnet's pole that points north?

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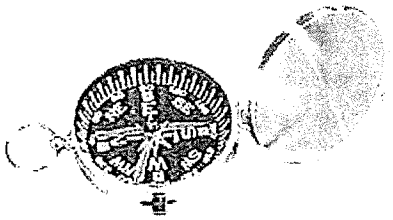

The needle in a compass is a magnet that is free to rotate.

TAKE A LOOK

4. Describe What is a compass?

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MAGNETIC FORCES

When you bring two magnets close together, the magnets exert a magnetic force on each other. **Magnetic force** can either push the magnets apart or pull them together. This force comes from spinning electric charges in the magnets. The force is a *universal* force. That means it is always present when magnetic poles come near each other. ☑

TAKE A LOOK

5. Describe What are two ways two magnets can be placed to show them repelling each other?

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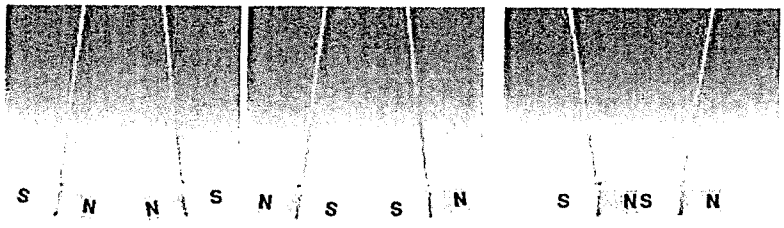


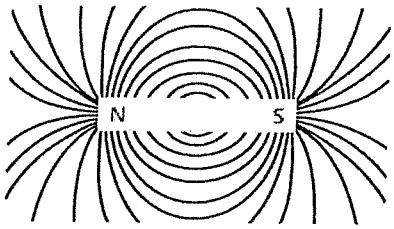
▲ If you hold the north poles of two magnets close together, the magnetic force will push the magnets apart. The same is true if you hold two south poles close together.

▲ When the north pole of one magnet is close to the south pole of another, magnetic force pulls the magnets together.

The magnetic force between magnets depends on how the poles of the magnets line up. Poles that are the same repel. So if you put two south poles together, they push apart. Opposite poles attract, as you can see in the pictures above.

MAGNETIC FIELDS

A magnetic field exists in the region around a magnet in which magnetic forces can act. We can show the shape of a magnetic field with lines drawn from the north pole of a magnet to the south pole. ☑



Magnetic field lines show the shape of the magnetic field around a magnet.

These lines map out the magnetic field and are called *magnetic field lines*. The closer together the field lines are, the stronger the magnetic field is. The lines around a magnet are closest together at the poles. That's where the magnetic force on an object is strongest. ☑

READING CHECK

6. Describe Magnetic field lines point in what direction?

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READING CHECK

7. Describe When looking at magnetic field lines, how can you tell where the field is strongest?

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What Causes Magnetism?

Some materials are magnetic. Some are not. For example, a magnet can pick up paper clips and iron nails. But it cannot pick up paper, plastic, pennies, or aluminum foil. Whether a material is magnetic depends on the material's atoms.

ATOMS AND DOMAINS

All matter is made of atoms. Electrons are negatively charged particles of atoms. As an electron moves around, it creates a magnetic field. The atom has a north and south pole. In materials that are not magnetic, magnetic fields of the atoms cancel each other out.

But in materials such as iron, nickel, and cobalt, groups of atoms are in tiny areas called *domains*. The north and south poles of the atoms in a domain line up and make a strong magnetic field. Domains are like tiny magnets of different sizes within an object. Most of the domains must line up for the object to be magnetic. ☑

READING CHECK

8. Explain Why is iron magnetic, but copper and aluminum are not?

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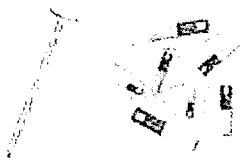

If the domains in an object are not aligned, the magnetic fields cancel. The object is not magnetic.

If the domains in an object are aligned, the magnetic fields combine. The object is magnetic.

LOSING ALIGNMENT

The figure on the previous page shows how domains work. If the domains line up, the object has a magnetic field. But the domains of a magnet may not always stay lined up. When domains move, the magnet is *demagnetized.* It loses its magnetic properties.

A magnet can lose its magnetic properties if you:

- drop or hit the magnet
- put the magnet in a strong magnetic field that is opposite to its own
- heat up the magnet (which makes the atoms vibrate faster).

Any one of the above actions can change the domains so they are no longer in line. ☑

READING CHECK

9. Describe What are two ways a magnet can lose its magnetic properties?

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MAKING MAGNETS

You can make a magnet out of, or *magnetize*, iron, cobalt, or nickel. You just need to line up the domains in it. For example, you can magnetize an iron nail if you rub it in one direction with one pole of a magnet. The domains in the nail line up with the magnetic field of the magnet. So the domains in the nail get in line. As more domains line up, the magnetic field of the nail grows stronger.

The process of making a magnet also explains how a magnet can pick up an object that is not magnetic. Bring a magnet close to a paper clip. Some domains in the paper clip line up with the field of the magnet. So the paper clip becomes a temporary magnet.

The north pole of the paper clip points toward the south pole of the magnet. The paper clip is attracted to the magnet. When the magnet is removed, the domains of the paper clip will become scrambled again.

Critical Thinking

10. Explain How is magnetizing an object the opposite of demagnetizing a magnet?

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TAKE A LOOK

11. Identify If the tip of the nail is a north pole, what is the pole on the end of the attached paper clip?

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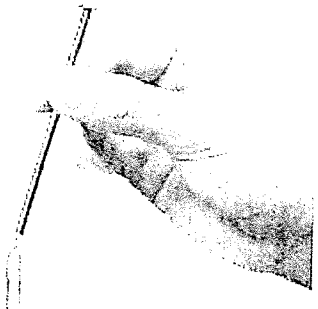
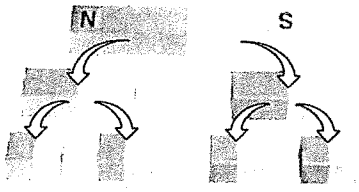


This nail was magnetized by dragging a magnet down it many times.

CUTTING A MAGNET

What do you think would happen if you cut a magnet in half? You might think that you would end up with one north-pole piece and one south-pole piece. But that's not what happens. Instead, when you cut a magnet in half, you get two magnets. Each piece has its own north and south pole. The picture below shows what happens when a magnet is cut.



If you cut a magnet in pieces, each piece will still be a magnet with two opposite poles.

A magnet has poles because its domains are lined up. Each domain within a magnet is like a tiny magnet with a north pole and a south pole. So even the smallest pieces of a magnet have two poles. ☑

READING CHECK

12. Explain Why do even the smallest magnets have two poles?

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What Kinds of Magnets Are There?

There are different ways to describe magnets. Some magnets are made of iron, nickel, cobalt, or mixtures of those metals. Magnets made with these metals have strong magnetic properties and are called *ferromagnets*. The mineral magnetite (which has iron in it) is an example of a natural ferromagnet. ☑

Another kind of magnet is the *electromagnet*. This is a magnet made by an electric current through a coil of wire. An electromagnet usually has an iron core.

READING CHECK

13. Define What is a ferromagnet?

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TEMPORARY AND PERMANENT MAGNETS

We also describe magnets as temporary or permanent. *Temporary magnets* are made from materials that are easy to magnetize. Something that is *temporary* does not last as long time. Temporary magnets lose their magnetization easily. Soft iron makes a good temporary magnet.

Permanent magnets are difficult to magnetize. However they keep their magnetic properties longer than temporary magnets. *Permanent* means something lasts or stays the same. Some permanent magnets are made with alnico, an alloy of aluminum, nickel, cobalt, and iron.

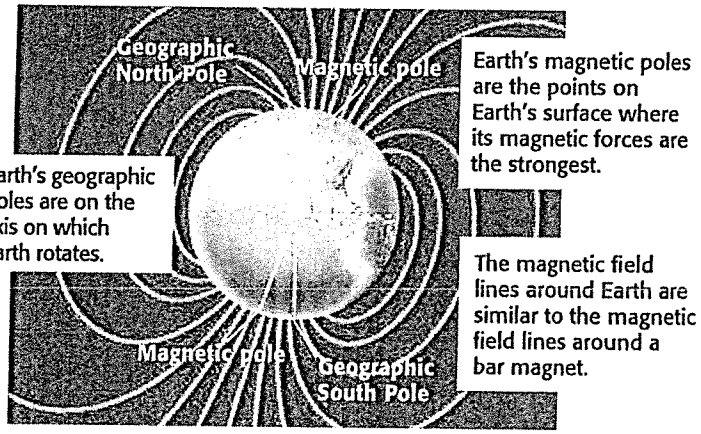
How Does the Earth Work as a Magnet?

Tie a string around a magnet so when the end of the string is held, the magnet is free to rotate. One end of the magnet will point north. For more than 2,000 years, travelers have used this property to find their way. You use it when you use a compass because a compass has magnet that is free to rotate.

ONE GIANT MAGNET

In 1600, an English doctor named William Gilbert suggested that magnets point to the north because Earth is one giant magnet. Earth really does act as if it has a bar magnet running through its center. The poles of this imaginary magnet are located near Earth's *geographic* poles. Geographic poles are the poles you see on maps.

Earth's Geographic and Magnetic Poles



TAKE A LOOK

14. Identify What are the magnetic field lines around Earth similar to?

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POLES OF A COMPASS NEEDLE

If you put a compass near a bar magnet, the marked end of the needle points to the south pole of the magnet. Does that surprise you? Remember that opposite poles of magnets attract each other. A compass needle is really a small magnet. The tip that points to the north is the needle's north pole. Therefore, the point of a compass needle moves toward the south pole of the magnet.

SOUTH MAGNETIC POLE NEAR NORTH GEOGRAPHIC POLE

A compass needle points north. This is because the magnetic pole of Earth that is closest to geographic north is a magnetic south pole. A compass needle points north because its north pole is attracted to the Earth's very large magnetic south pole. ☑

READING CHECK

15. Identify Is Earth's north pole a magnetic north pole or a magnetic south pole?

_____

THE CORE OF THE MATTER

Earth may act as if it has a giant bar magnet through its center, but there isn't really a magnet there. The temperature of Earth's core (or center) is very high. That makes the atoms in it move too violently to stay lined up in domains.

Scientists think that the movement of electric charges in the Earth's core creates Earth's magnetic field. The Earth's core is made mostly of iron and nickel. Great pressure makes Earth's inner core solid. The outer core is liquid because the pressure is not as high. As Earth rotates, the liquid in the core flows. That makes electric charges move, which makes a magnetic field. ☑

READING CHECK

16. Explain What do scientists think causes Earth's magnetic field?

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A MAGNETIC LIGHT SHOW

The beautiful curtain of light in the picture below is called an *aurora*. Earth's magnetic field plays a part in making auroras. An aurora forms when charged particles from the sun hit oxygen and nitrogen atoms in the air. The atoms become excited and then give off light of many colors.

Earth's magnetic field blocks most of the charged particles from the sun. However, the field bends inward at the magnetic poles. This causes the charged particles from the sun to enter the atmosphere at and near the poles. We see auroras near Earth's North Pole. They are called the northern lights, or *aurora borealis*. Auroras near the South Pole are called the southern lights, or *aurora australis*. ☑

READING CHECK

17. Identify What causes charged particles from the sun to bend inwards after entering the atmosphere?

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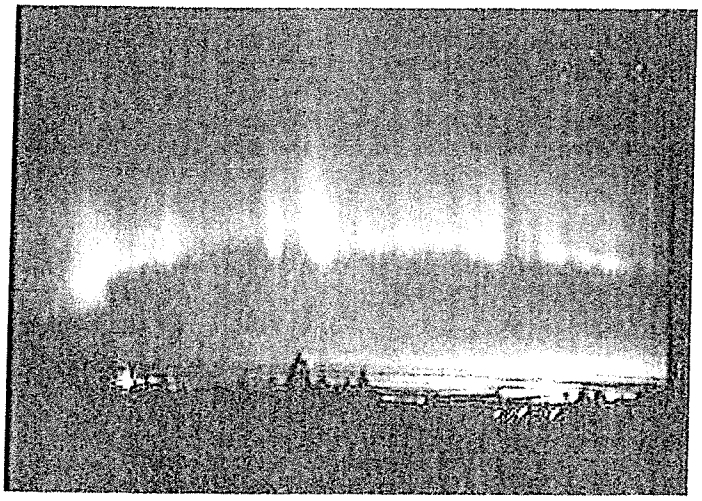


An aurora is an amazing light show in the sky.

Name _____ Class _____ Date _____

Section 1 Review

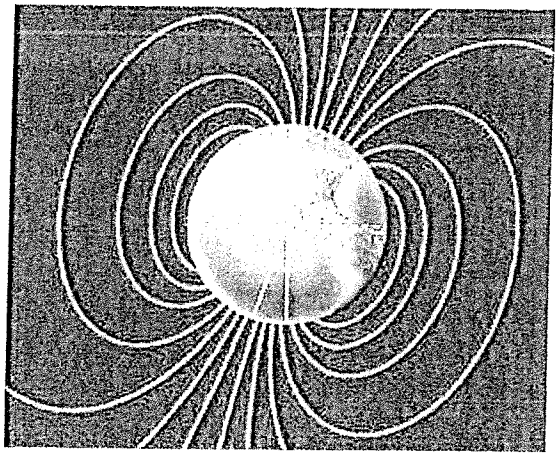
NSES NSES PS 3a

SECTION VOCABULARY

magnet any material that attracts iron or materials containing iron **magnetic force** the force of attraction or repulsion generated by moving or spinning electric charges	**magnetic pole** one of two points, such as the ends of a magnet, that have opposing magnetic qualities

1. **Describe** How do you make a metal object such as a nail into a magnet? What happens to make it magnetic?

2. **Interpret Graphics** Which magnetic pole is closest to the geographic North Pole?



3. **Explain** Is the magnetic field of Earth stronger near the equator or near the South Pole? Why?

4. **Explain** Why are some objects magnetic and others are not?

5. **Identify** If a material is difficult to magnetize but stays magnetized, what kind of magnet is it?

6. **Infer** Why would heating a magnetic demagnetize it?

Name _____ Class _____ Date Week 2

CHAPTER 18 Electromagnetism

SECTION 2

Magnetism from Electricity

Day 2 of 10

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- How are an electric current and a magnetic field related?
- What are solenoids and electromagnets?
- How does electromagnetism run doorbells, electric motors, and galvanometers?

National Science Education Standards

PS 3a

How Was Electromagnetism Discovered?

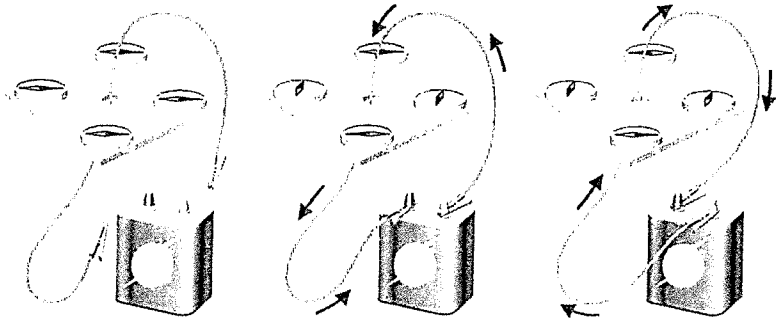
Many things around you—doorbells and motors, for example—use electricity to make magnetism. In this section, you will learn how electricity and magnetism are related and how we make electromagnets.

Danish physicist Hans Christian Oersted discovered how electricity and magnetism are related in 1820. While teaching a class, he held a compass near a wire carrying an electric current. When the compass was brought close to the wire, the compass needle moved. It no longer pointed to the north. He had accidentally discovered that electricity and magnetism are related.

A compass needle is a magnet. It moves from its north-south position only when it is in a magnetic field different from Earth's. Oersted tried a few experiments with the compass and the wire. He learned that electric current produces a magnetic field. That made the needle of the compass line up with the direction of the magnetic field. The picture below shows how his experiments worked.

STUDY TIP

Compare As you read this section, make a table to compare solenoids and electromagnets.



A If no electric current is in the wire, the compass needles point in the same direction.

B Electric current in one direction causes two compass needles to deflect in a clockwise direction.

C Electric current in the opposite direction causes the two compass needles to deflect in a counter-clockwise direction.

TAKE A LOOK

1. Describe Why does a compass needle move when it is near a wire with an electric current running though it?

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MORE RESEARCH

Oersted also found that the direction of the magnetic field depends on the direction of the current. The French scientist André-Marie Ampère heard about Oersted's findings. Ampère did more research with electricity and magnetism. Their work was the first research into electromagnetism. **Electromagnetism** is the interaction between electricity and magnetism. ☑

READING CHECK

2. Define What is electromagnetism?

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How Do We Use Electromagetism?

The magnetic field produced by an electric current in a wire can move a compass needle. But the magnetic field is not strong enough to be very useful. However, two devices, the solenoid and the electromagnet, make the magnetic field stronger. They make electromagnetism more useful.

SOLENOIDS

A single loop of wire that carries a current does not have a very strong magnetic field. But if you form many loops into a coil, it makes the magnetic field stronger. The magnetic fields of the loops work together.

The picture below shows a solenoid. A **solenoid** is a coil of wire that produces a magnetic field when an electric current runs through it. The magnetic field around a solenoid is very similar to the magnetic field of a bar magnet. The magnetic field of a solenoid gets stronger if it has more loops. The magnetic field also becomes stronger as the current in the wire increases. ☑

READING CHECK

3. Identify What are two things you can do to make the magnetic field of a solenoid stronger?

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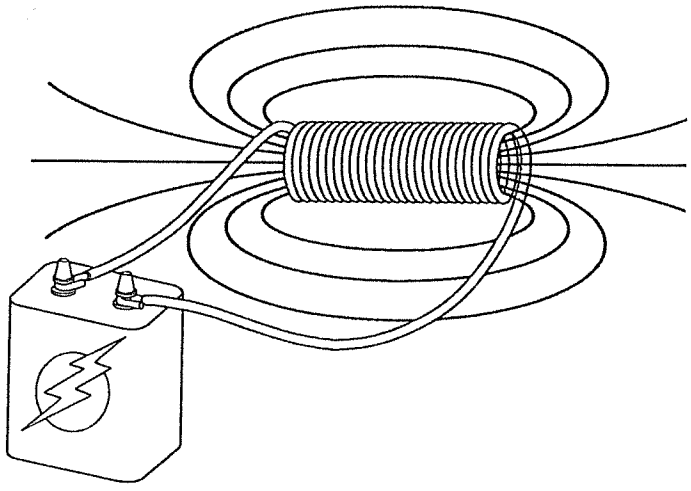

The ends of the solenoid are like the poles of a bar magnetic.

ELECTROMAGNETS

We can make magnets with an even stronger magnetic field than one made by a solenoid. Electromagnets can make a train float! An **electromagnet** is made up of a solenoid wrapped around an iron core. It acts as a magnet when an electric current runs through the coil. The magnetic field of the solenoid makes the domains inside the iron core line up.

The magnetic field of the electromagnet is the field of the solenoid plus the field of the magnetized core. As a result, the magnetic field of an electromagnet may be hundreds of times stronger than the magnetic field of just the solenoid. You can make an electromagnet stronger by increasing the number of loops per meter in the solenoid. You can also increase the electric current in the wire. ☑

Engineers have developed trains called *maglev* trains that use electromagnetism. Maglev is a short name for *magnetic levitation*. Instead of rolling on wheels over the tracks, these trains *levitate*, or float, above the track. How? Remember what happens when you bring two magnets close together—the magnets exert a magnetic force on each other. In maglev trains, powerful electromagnets in the rails repel strong magnets on the train cars.

READING CHECK

4. Explain Why is the magnetic field of an electromagnet stronger than a solenoid?

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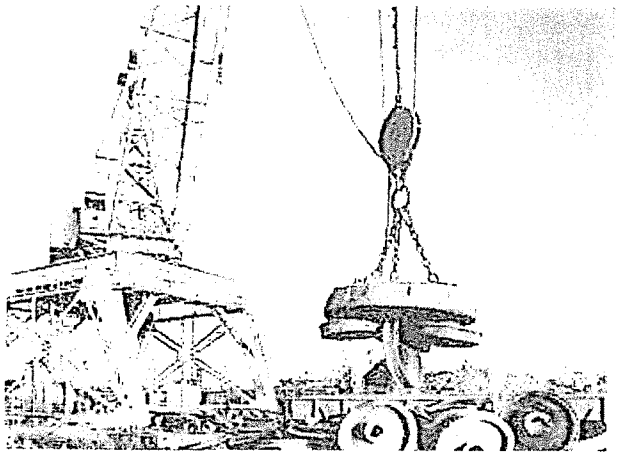

Electromagnets used in salvage yards are turned on to pick up iron objects and turned off to put them down.

TURNING ELECTROMAGNETS ON AND OFF

Electromagnets are very useful because we can turn them on and off. The solenoid has a field only when electric current runs through it. So electromagnets attract things only when a current exists in the wire. When no current runs through the wire, the electromagnet turns off.

Critical Thinking

5. Infer Why could an electromagnet be more useful than a permanent magnet?

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Applications of Electromagnetism

You may not ride on a maglev train, but you use electromagnetism in simple ways every day. For example, you use a solenoid when you ring a doorbell. Electromagnetism makes vending machines give you the right change. It's what makes metal detectors and motors work. An electromagnet makes the fuel gauge in a car work. ☑

READING CHECK

6. Name What are two things that operate using electromagnetism?

_____

_____

DOORBELLS

Have you ever noticed a doorbell button that has a light inside? When you pushed the button, did the light go out? Two solenoids in the doorbell allow the doorbell to work.

When you push the button, it opens the circuit of the first solenoid. The current stops. That makes the magnetic field drop and the light go out. The change in the field causes a current in the second solenoid. This current induces a magnetic field that pushes an iron rod and that makes the bell ring.

MAGNETIC FORCE AND ELECTRIC CURRENT

An electric current in a wire can cause a compass needle to move. The needle is a small magnet. The needle moves because the electric current in a wire creates a magnetic field that exerts a force on the needle. ☑

READING CHECK

7. Explain Why does a wire having an electric current running through it cause a compass needle to move?

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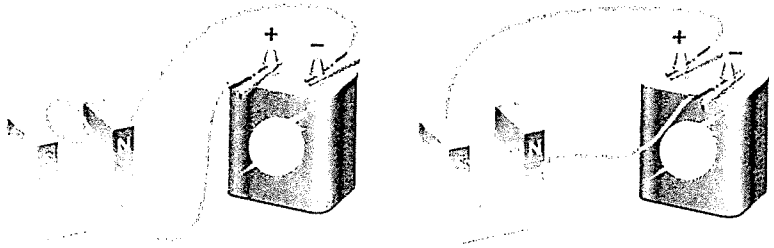
Can a magnet cause a wire that has an electric current running through it to move? The picture below shows that the answer is yes. The wire is pushed up or down depending on the direction of the current in the wire. This force makes electric motors work.



a A wire is connected to a battery as shown above. When the wire is placed between two poles of a strong magnet, the wire will move up.

b Switching the wires at the battery reverses the direction of the electric current. Now the wire will be pushed down.

ELECTRIC MOTORS

An **electric motor** is a device that changes electrical energy into mechanical energy. All electric motors have an *armature*—a loop or coil of wire that can rotate. The armature is mounted between the poles of a permanent magnet or electromagnet.

An electric motor that uses direct current, like the one below, contains a device called a commutator. It is attached to the armature to reverse the direction of the electric current in the wire.

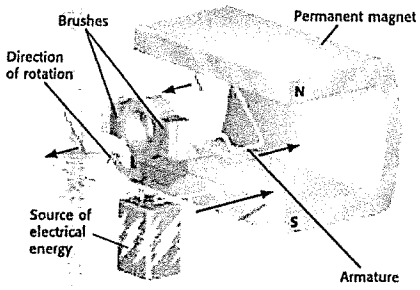
A *commutator* is a ring that is split in half and connected to the ends of the armature. Electric current enters the armature through brushes that touch the commutator. Every time the armature and the commutator make a half turn, the direction of the current in the armature reverses.

STANDARDS CHECK

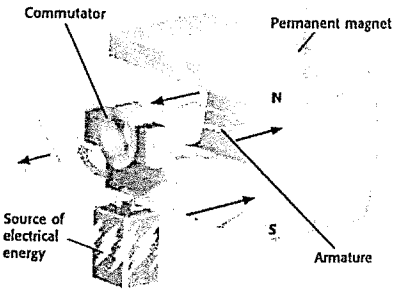
PS 3a Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.

8. Identify An electric motor changes electrical energy into what kind of energy?

_____



Getting Started The electric current in the armature causes the magnet to push on the armature. The current is moving in a different direction in either side of the armature. So one side is pushed up and the other side down. This causes the armature to rotate.



Running the Motor The commutator causes the electric current in the rotating armature to change directions. This causes the side that was pushed down to be pushed up and the other side to be pulled down. So the armature keeps rotating in the same direction.

GALVANOMETERS

A *galvanometer* measures current or voltage. Electricians use galvanometers when they use ammeters and voltmeters. ☑

A galvanometer has an electromagnet placed between the poles of a permanent magnet. The electromagnet is free to rotate and is attached to a pointer. A current in the galvanometer causes the permanent magnet to push the electromagnet, rotating the pointer. The pointer moves along a scale that shows the size and direction of the current, or the voltage.

READING CHECK

9. Identify What does a galvanometer measure?

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_____

Name _____ Class _____ Date _____

Section 2 Review

NSES PS 3a

SECTION VOCABULARY

electric motor a device that converts electrical energy into mechanical energy **electromagnet** a coil that has a soft iron core and that acts as a magnet when an electric current is in the coil	**electromagnetism** the interaction between electricity and magnetism **solenoid** a coil of wire with an electric current in it

1. **Describe** What does an electric current through a wire produce? What affects the strength of what is produced?

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2. **Interpret Graphics** Which of the magnets below is a solenoid? Which one is an electromagnet? Label each one. If the current and the number of coils are the same, which of the magnets has a stronger magnetic field?

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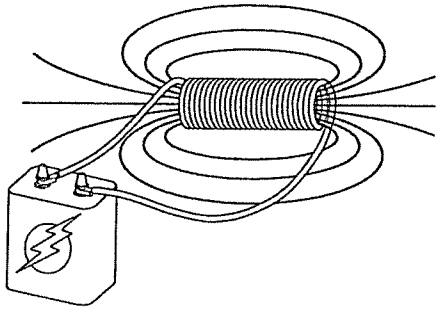

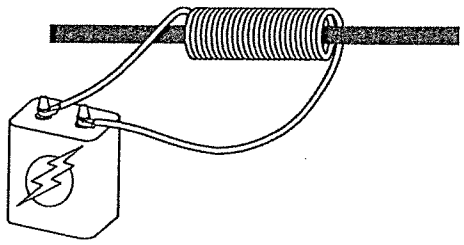

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3. **Explain** Why does a current in a galvanometer move a pointer?

_____

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4. **Name** What are four devices that use electromagnetism?

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5. **Explain** What makes the armature in an electric motor rotate?

_____

Name _____ Class _____ Date WEEK 2

CHAPTER 18 Electromagnetism

SECTION 3

Electricity from Magnetism

Day 5

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- How can a magnetic field make an electric current?
- How does a generator use electromagnetic induction?
- What are step-up and step-down transformers?

National Science Education Standards

PS 3a

How Does a Changing Magnetic Field Make an Electric Current?

Hans Christian Oersted discovered that an electric current could make a magnetic field. Soon after, scientists wondered if a magnetic field could make an electric current. In 1831, two scientists solved this problem. Joseph Henry, of the United States, made the discovery first. However, Michael Faraday, from Great Britain, published his results first. Faraday also reported them in great detail, so we know more about his results.

STUDY TIP

Summarize Read this section silently. In pairs, take turn summarizing the material. Stop to discuss ideas that seem confusing.

FARADAY'S EXPERIMENT

Faraday used a setup like the one in the picture below. The ring is an electromagnet. He hoped that the magnetic field of the electromagnet would make, or induce, an electric current in the second wire. But no matter how strong the electromagnet was, he could not make an electric current in the second wire. ☑

READING CHECK

1. Explain What was Faraday trying to do in his experiment?

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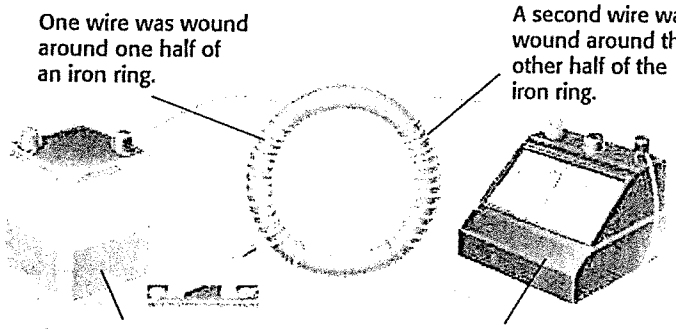
Faraday's Experiment with Magnets and Induction



SUCCESS FOR AN INSTANT

As Faraday experimented with the electromagnetic ring, he noticed something interesting. At the instant he connected the wires to the battery, the galvanometer pointer moved. This movement showed that an electric current was present. The pointer moved again at the instant he disconnected the battery. However, he did not see an electric current when the battery was fully connected.

Faraday saw that electric current in the second wire happened only when the magnetic field changed. It changed as the battery was connected and disconnected. The process of creating a current in a circuit by a changing a magnetic field is called **electromagnetic induction**. Faraday did many more experiments in this area. Some of his results are shown in the figure below. ☑

READING CHECK

2. Describe What is electromagnetic induction?

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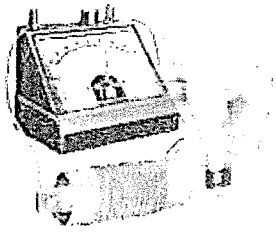
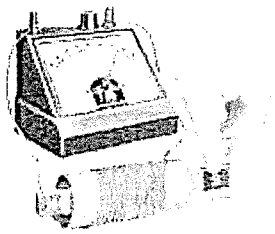
Factors that Affect an Induced Current



a An electric current is induced when you move a magnet through a coil of wire.



b A greater electric current is induced if you move the magnet faster through the coil because the magnetic field is changing faster.

TAKE A LOOK

3. Identify What are two factors that determine the size of the electric current induced?

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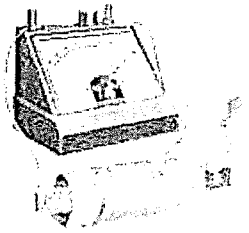
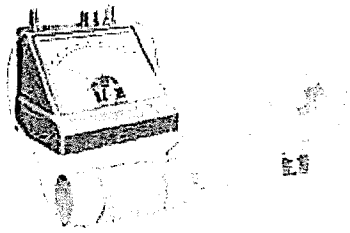


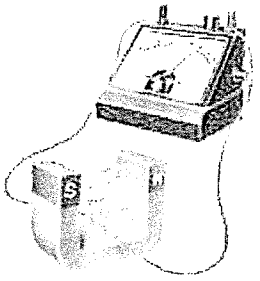
c A greater electric current is induced if you add more loops of wire. This magnet is moving at the same speed as the magnet in b.



d The induced electric current reverses direction if the magnet is pulled out rather than pushed in.

INDUCING ELECTRIC CURRENT

Faraday's experiments also showed that moving either the magnet or the wire changes the magnetic field around the wire. An electric current is made when a magnet moves in a coil of wire. An electric current is also made when a wire moves between the poles of a magnet.



As the wire moves between the poles of the magnet, it cuts through magnetic field lines. This induces an electric current.

In the figure above, an electric current is induced only by moving the wire across the magnetic field lines. Moving the wire induces the current because the force at each magnetic field line makes electric charges move. The charges only move in a wire when the wire moves through the magnetic field.

TAKE A LOOK

4. Predict If the wire in the picture does not move, will there be an electric current? Explain your answer.

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How Do Electric Generators Work?

Every day, you use electricity made by machines called *generators*. The figure below shows the parts of a simple generator.

Electric motors turn electrical energy into mechanical energy (movement). An **electric generator** uses electromagnetic induction to change mechanical energy into electrical energy. ☑

READING CHECK

5. Describe What does an electric generator do?

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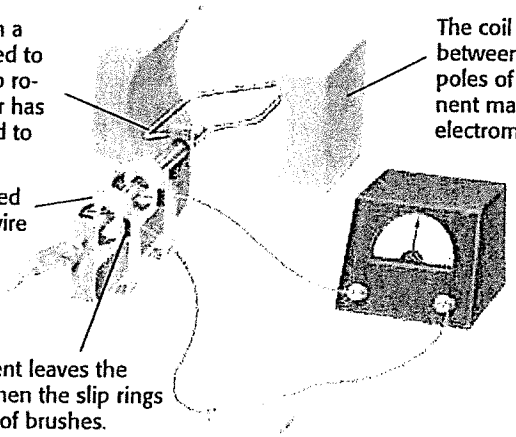
Parts of a Simple Generator

Generators contain a coil of wire attached to a rod that is free to rotate. This generator has a crank that is used to turn the coil.

Slip rings are attached to the ends of the wire in the coil.



The coil is placed between the poles of a permanent magnet or electromagnet.

Electric current leaves the generator when the slip rings touch a pair of brushes.

TAKE A LOOK

6. Identify What is the source of mechanical energy for this electric generator?

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ALTERNATING CURRENT

The electric current that the generator produces changes direction each time the coil makes a half-turn. Because the electric current changes direction, it is an alternating current. Generators in power plants make alternating current.

Generators in power plants are very large. They have many coils of wire instead of just one. In most large generators, the magnet turns instead of the coils.

STANDARDS CHECK

PS 3a Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.

7. Identify What are three sources of energy that generators turn into electrical energy?

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GENERATING ELECTRICAL ENERGY

The energy that generators convert into electrical energy comes from different sources. The source in nuclear power plants is thermal energy from a nuclear reaction. The energy boils water into steam. The steam turns a turbine. The turbine turns the magnet of the generator, which induces electric current and generates electrical energy. Other kinds of power plants burn fuel such as coal or gas to release thermal energy.

We can use energy from wind to turn turbines. We also convert the power of rushing water into electrical energy in a hydroelectric power plant.

What Are Transformers?

Another device that relies on induction is a transformer. A **transformer** increases or decreases the voltage of alternating current. A simple transformer is made up of two coils of wire wrapped around an iron ring. The *primary* (or first) coil gets alternating current from an electrical energy source. The current makes an iron ring an electromagnet. The changing magnetic field in the iron ring induces a current in the *secondary* (or second) coil. ☑

The number of loops in the primary and secondary coils determines if the voltage increases or decreases. The table below shows how voltage is affected by the number of loops.

READING CHECK

8. Describe What does a transformer do?

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_____

_____

Math Focus

9. Compare Suppose the secondary coil has 100 loops and the primary coil has 200. What is the secondary coil voltage compared to the primary coil voltage?

_____

Number of loops in primary coil	Number of loops in secondary coil	Voltage in primary coil	Voltage in secondary coil
10	20	100 V	200 V
40	20	100 V	50 V

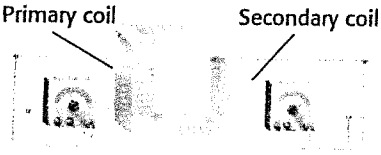
STEP-UP, STEP-DOWN

The figure below shows two types of transformers. The type of transformer is determined by the number of loops in the primary and secondary coils.

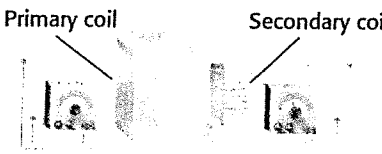
A *step-up transformer* has more loops of wire in the secondary coil, so it increases voltage and decreases current. A *step-down transformer* has fewer loops of wire in the secondary coil, so it decreases voltage and increases current. However, the amount of energy going into and out of the transformer does not change.

How Transformers Change Voltage

Step-up Transformer The primary coil has fewer loops than the secondary coil. So, the voltage in the secondary coil is higher than the voltage in the primary coil. The voltage is increased.



Step-down Transformer The primary coil has more loops than the secondary coil. So, the voltage in the secondary coil is lower than the voltage in the primary coil. The voltage is decreased.



Math Focus

10. Determine A transformer has 300 loops in the primary coil and 100 loops in the secondary coil. The primary coil voltage is 90 V. What would be the voltage in the secondary coil? What kind of transformer is this?

_____

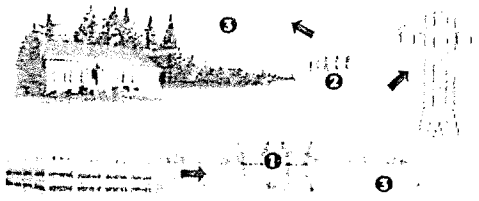
_____

ELECTRICAL ENERGY FOR YOUR HOME

Electric power companies supply energy for most homes. Electricity travels over long distances. As it travels, it loses power in the form of heat because of the resistance in the cables. Much less power is wasted if the current is low and voltage high. So power companies transmit electricity at high voltage and low current.

However, high voltage in your home is dangerous. So, the voltage must be decreased again before the current goes to your home. Two step-down transformers decrease the voltage before the current enters your home. ☑

Getting Energy to Your Home



1. The voltage is stepped up thousands of times at the power plant.
2. The voltage is stepped down at a local power distribution center.
3. The voltage is stepped down again at a transformer near your house.

READING CHECK

11. Describe Why are step-down transformers needed before the electricity from the power company enters your home?

_____

_____

_____

Name _____ Class _____ Date _____

Section 3 Review

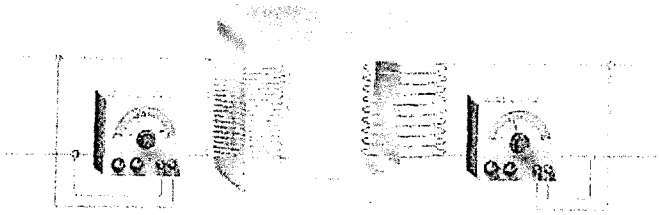
NSES PS 3a

SECTION VOCABULARY

electric generator a device that converts mechanical energy into electrical energy **electromagnetic induction** the process of creating a current in a circuit by changing a magnetic field	**transformer** a device that increases or decreases the voltage of alternating current

1. **Compare** How are an electric generator and an electric transformer different?

2. **Interpret Graphics** What kind of transformer is the transformer below? How does the voltage change with this kind of transformer?



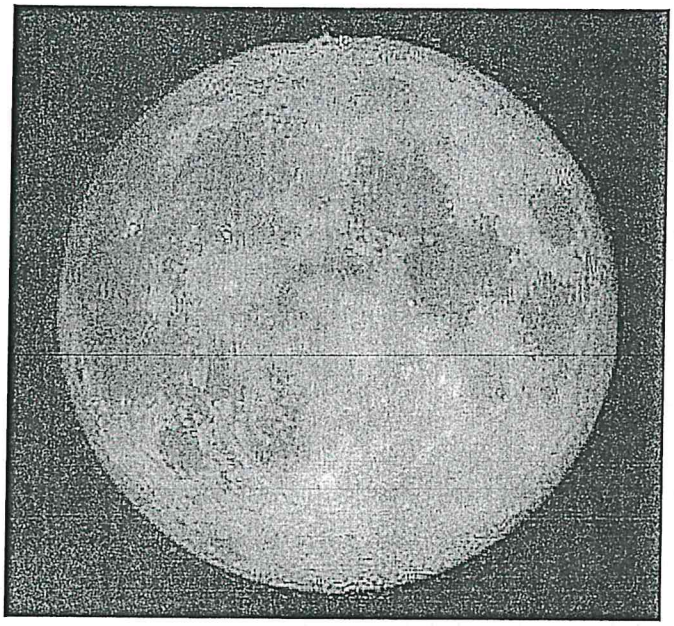
3. **Determine** A transformer has 500 loops in its primary coil and 5,000 loops in its secondary coil. What is the voltage in the secondary coil if the voltage in the primary coil is 2,000 V? What type of transformer is this?

4. **Explain** How does a generator produce an electric current?

5. **Explain** Why does an electric power plant increase the voltage of electricity as it leaves the power plant on its way to your home?

P.S. WEEK 2
Day 3

An Unexpected Trip



Sarah wasn't quite sure what was going on. She had been sitting in the back of the car for hours as it rumbled up the highway's six spotless lanes. There were not many other cars. When they turned off the main highway, Sarah wasn't very worried. This was the way to the house her parents had far, far out in the country. She'd been before, for summers. Sometimes she got to bring her friend, Sam. Going to the house by itself did not worry Sarah. The chains rattling around the back seat next to her, though, were a different story.

Sarah's mom and dad had said not to worry and that everything was fine. If everything was fine, though, why had they gotten so upset when the phone had rung last night? This time of month, Sarah usually spent the night with her grandmother, watching old movies and eating popcorn that Grandma made on the stove in a pot (not in the microwave). It was delicious. She couldn't quite make out what her mom had been saying into the phone. Something like, "What do you mean, you can't come, Mom? I need you. No, you don't understand; it has to be tomorrow night!" Later, her mom and dad told her that Grandma wasn't coming, and that she'd have to come on a little car ride with them.

Her mom looked down, and twisted her fingers together. "Your dad . . . he has some things he has to do. Alone. We'll see him in the morning." Suddenly, she stood up. "Sarah, it's time for bed."

"Mom! It's not even dark out!"

"Sarah."

"And I'm not tired! I just woke up!"

"Don't argue with me!" Sarah's mom yelled. She hardly ever yelled. Sarah was a little scared. Mom let out a deep sigh. "Sarah, honey, we should go to bed. It's been a long day. I'll lie down with you."

They went to her room, and read books together. Sarah was not tired. They talked and read for a long time. Eventually, Sarah's mom fell asleep. Sarah tossed and turned, burrowing her head into her mom or rolling far across the bed. She decided she needed to walk around a bit. Her legs were crampy. Plus, she *had* had an awful lot of soda to drink. She got up to walk to the bathroom.

The bedroom door opened with a long, low creaking sound. All the lights in the house were off. Sarah could only see because of the big full moon shining through the windows. She put her hands on the wall, feeling her way forward, bumping into tables and tripping on shoes. Just as she got near the bathroom, she realized she could hear a sound. It was like a wailing, crying sound. It was like a dog that was hurt, but also somehow . . . different. Mixed in with the howls and yelps were the sounds of the chains rattling. Sarah remembered that sound—the one the chains next to her in the car made every time it hit a bump in the road. What was going on?

She realized the sound was coming from the garage, which connected to the house via a small door. As Sarah crept towards the door, the howling stopped. What was in there? It sounded hurt and afraid. Maybe Sarah could help it?

Name: _____ Date: _____

1. Where do Sarah and her parents go?

A a movie theater
B a store that has stuffed animals
C a house in the country
D the house where Sarah's grandmother lives

2. What is the climax of the action in the story?

A Sarah's parents make her popcorn.
B Sarah falls asleep after her mom puts one of her favorite movies on the TV.
C Sarah's parents let her pack as many toys as she wants.
D A huge animal leaps at Sarah in the garage.

3. Read the following sentences: "Sarah's mom and dad had said not to worry and that everything was fine. If everything was fine, though, why had they gotten so upset when the phone had rung last night?"

What can be concluded from these sentences?

A Something may be wrong, but Sarah's parents do not want to talk about it.
B Last night a stranger called Sarah's home to give her mom and dad some good news.
C Sarah's mom and dad are cheerful people who never worry about anything.
D Sarah's mom and dad are worried about how much it will cost to go on a family trip.

4. How does Sarah feel on the trip she takes with her parents?

A confident and happy
B confused and scared
C angry and upset
D eager and hopeful

5. What is this story mainly about?

A making popcorn on the stove instead of in the microwave
B the car in which Sarah and her parents drive to a house in the country
C the special nights that a girl spends with her grandmother
D two parents who try to keep a secret from their daughter

9. What does Sarah's dad ask her at the end of the story?

10. Why does Sarah's dad ask her whether she knows what a werewolf is? Support your answer with evidence from the story.

WEEK 2

Name Day 1, 2 Date Period

Final Mastery Test

Part A Choose the best answer. Write the letter on the line.

_____ **1.** What is the study of energy and how it acts with matter?

A physics **B** biology **C** chemistry **D** genetics

_____ **2.** What property of a solid object could you measure with the displacement of water method?

A weight **B** density **C** volume **D** mass

_____ **3.** The central part of an atom is called the _____.

A proton **B** neutron **C** nucleus **D** electron shell

_____ **4.** Elements in the periodic table are organized _____.

A alphabetically by symbol **C** by increasing atomic mass

B in numeric atomic number order **D** alphabetically by element name

_____ **5.** SO_4 is an example of a(n)

A atom **B** element **C** solution **D** radical

_____ **6.** A substance that is formed in a chemical reaction is a _____.

A product **B** reactant **C** solvent **D** mixture

_____ **7.** What is the rate of change in velocity?

A acceleration **B** gravitation **C** deceleration **D** speed

_____ **8.** Which simple machine consists of a bar that is free to move about a fixed point?

A wedge **B** pulley **C** lever **D** screw

_____ **9.** A liquid changes to a gas _____.

A at the melting point **C** at the freezing point

B by evaporating **D** by condensing

_____ **10.** White light is made up of _____.

A the electromagnetic spectrum **C** an ultrasound

B a prism **D** the visible spectrum

Final Mastery Test, continued

24. The formula for work is force × _____.

25. A book on the edge of a table has _____ energy.

26. Heat can be produced by _____ the motion of particles in matter.

27. When a substance changes from a liquid to a solid, it has reached the _____ point.

28. A(n) _____ is a reflection of sound back to its source.

29. Photons are small bundles of energy that make up _____.

30. A(n) _____ is a point where electrons leave or enter a battery.

31. In a series circuit, all _____ flows through a single path.

32. Electromagnets work when electric current is _____.

33. A motor used to run a refrigerator is an example of a use of _____.

34. Opposite magnetic poles _____ each other.

35. A(n) _____ is a simple machine that is a form of inclined plane wrapped in a spiral around a piece of metal.

36. Deceleration is the rate of _____.

37. A mixture of sugar and water is an example of a(n) _____.

38. Scientists use a(n) _____ number to tell how many of an element's atoms are in a compound.

39. The _____ Fe stands for the element iron.

40. Electrons are atomic particles that have a(n)_____ charge.

41. A(n) _____ is the instrument used to measure mass.

42. One thousand meters equal one _____.

43. Lightning is the discharge of _____ between clouds or clouds and Earth.

44. _____ is used to measure distances under water.

45. Most metals are good _____ of heat.

Final Mastery Test, continued

56. The formula below shows which of Newton's three laws of motion? _____

force = mass × acceleration

57. You want to find the volume of a small seashell.

A What method would you use to measure the volume of this irregularly shaped object?

_____

B Explain what you would do to find the volume of the seashell.

_____

_____

_____

Part D Write a short answer to each question.

58. What happens when atoms of elements combine to form compounds?

_____

_____

_____

59. What is a reaction?

_____

_____

_____

60. List the six main forms of energy.

A _____

B _____

C _____

D _____

E _____

F _____

Algebra WEEK 2 DAY 1

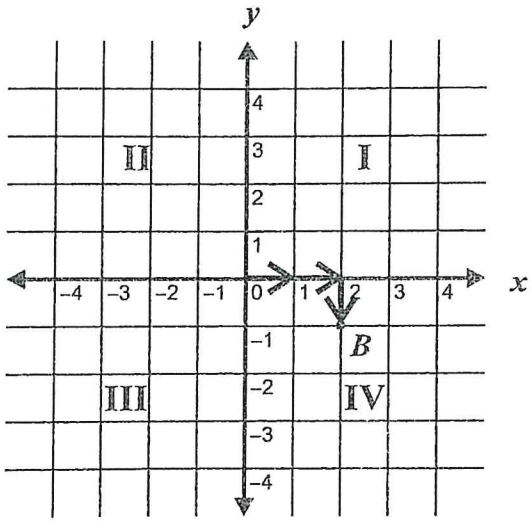
CARTESIAN COORDINATES

A number line allows you to graph points with only one value. A **Cartesian coordinate plane** allows you to graph points with two values. A Cartesian coordinate plane is made up of two number lines. The horizontal number line is called the ***x*-axis** and the vertical number line is called the ***y*-axis**. The point where the x and y axes intersect is called the **origin**. The x and y axes separate the Cartesian coordinate plane into four quadrants that are labeled I, II, III, and IV. The quadrants are labeled and explained on the graph below. Each point graphed on the plane is designated by an **ordered pair** of coordinates. For example, $(2, -1)$ is an ordered pair of coordinates designated by **point B** on the plane below. The first number, 2, tells you to go over positive two on the x-axis. The -1 tells you to then go down negative one on the y-axis.

Remember: The first number always tells you how far to go right or left of 0, and the second number always tells you how far to go up or down from 0.

Quadrant II:
The x-coordinate is negative, and the y-coordinate is positive $(-, +)$.

Quadrant III:
Both coordinates in the ordered pair are negative $(-, -)$.

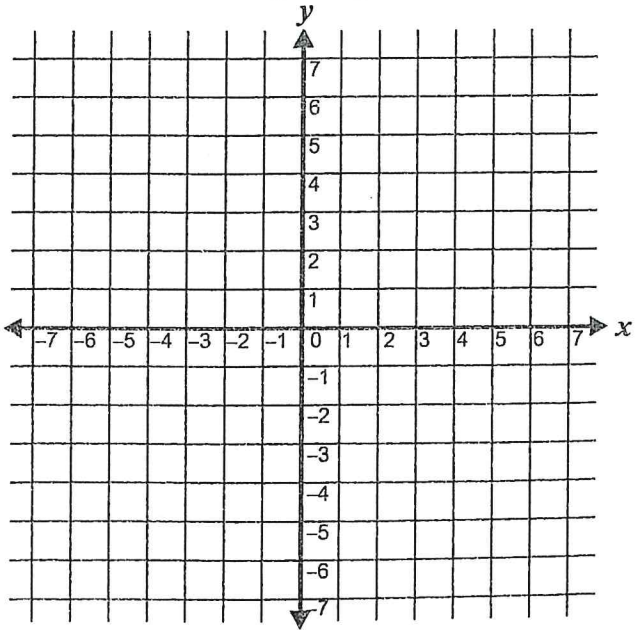


Quadrant I:
Both coordinates in the ordered pair are positive $(+, +)$.

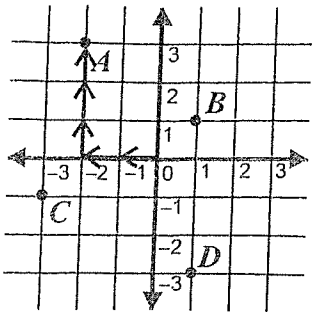
Quadrant IV:
The x-coordinate is positive and the y-coordinate is negative $(+, -)$.

Plot and label the following points on the Cartesian coordinate plane provided.

A.	(2, 4)	*K.*	(−1, −1)
B.	(−1, 5)	*L.*	(3, −3)
C.	(3, −4)	*M.*	(5, 5)
D.	(−5, −2)	*N.*	(−2, −2)
E.	(5, 3)	*O.*	(0, 0)
F.	(−7, −6)	*P.*	(0, 4)
G.	(−2, 5)	*Q.*	(2, 0)
H.	(6, −1)	*R.*	(−4, 0)
I.	(4, −7)	*S.*	(0, −2)
J.	(6, 2)	*T.*	(5, 1)



IDENTIFYING ORDERED PAIRS



When identifying **ordered pairs**, count how far left or right of 0 to find the x-coordinate and then how far up or down from 0 to find the y-coordinate.

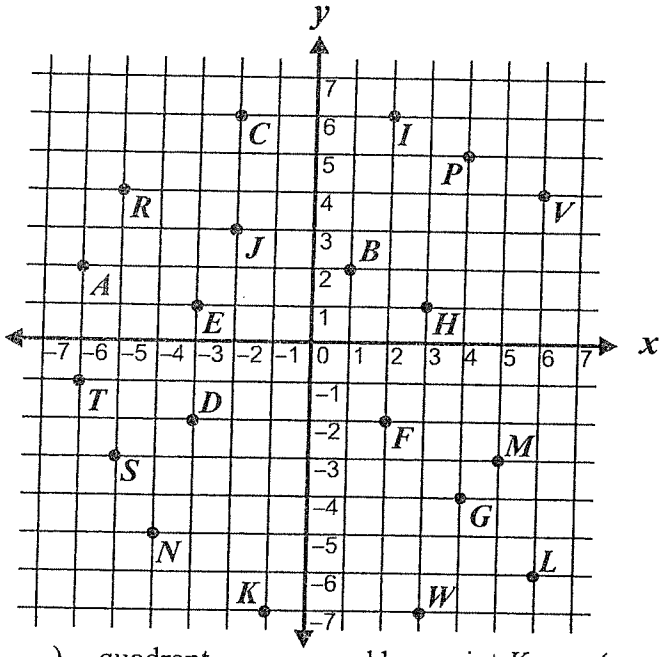
Point *A*: Left (negative) two and up (positive) three = (–2, 3) in quadrant II

Point *B*: Right (positive) one and up (positive) one = (1, 1) in quadrant I

Point *C*: Left (negative) three and down (negative) one = (–3, –1) in quadrant III

Point *D*: Right (positive) one and down (negative) three = (1, –3) in quadrant IV

Fill in the ordered pair for each point, and tell which quadrant it is in.



1. point A = (,) quadrant _____
2. point B = (,) quadrant _____
3. point C = (,) quadrant _____
4. point D = (,) quadrant _____
5. point E = (,) quadrant _____
6. point F = (,) quadrant _____
7. point G = (,) quadrant _____
8. point H = (,) quadrant _____
9. point I = (,) quadrant _____
10. point J = (,) quadrant _____
11. point K = (,) quadrant _____
12. point L = (,) quadrant _____
13. point M = (,) quadrant _____
14. point N = (,) quadrant _____
15. point P = (,) quadrant _____
16. point R = (,) quadrant _____
17. point S = (,) quadrant _____
18. point T = (,) quadrant _____
19. point V = (,) quadrant _____
20. point W = (,) quadrant _____

WEEK 2
Day 2

Chapter 1 Test

Directions: Write true or false or open for each statement.

1. $14 - 8 = 6$ _____
2. $1 \cdot 10 = 1$ _____
3. $n + 4 = 29$ _____
4. $5 \cdot 0 = 5$ _____
5. $\frac{x}{6} = 42$ _____
6. $27 + 36 = 63$ _____

rections: Identify each expression as Numerical or Algebraic

7. $C - 1$ _____
8. $2x$ _____
9. $54 + 16$ _____
10. $140 \div b$ _____
11. $5 \cdot 7$ _____
12. $\frac{d}{23}$ _____

ections: Find the opposite.

13. -6 _____
14. $+24$ _____
15. $-4/5$ _____
16. $+16.3$ _____
17. 0 _____
18. $+3\frac{7}{8}$ _____
19. -2.1 _____
20. $+10$ _____

WEEK 2 Day 3, 1

Ohio Graduation Test Mathematics Review Sheet

Area (A) Formulas

parallelogram: $A = bh$

rectangle: $A = lw$

trapezoid: $A = \frac{1}{2}h(b_1 + b_2)$

triangle: $A = \frac{1}{2}bh$

Volume (V) Formulas

cone: $V = \frac{1}{3}\pi r^2 h$

cylinder: $V = \pi r^2 h$

pyramid: $V = \frac{1}{3}Bh$ B = area of base

rectangular prism: $V = lwh$

right prism: $V = Bh$ B = area of base

sphere: $V = \frac{4}{3}\pi r^3$

Circle Formulas

$C = 2\pi r$ $\pi \cong 3.14$ or $\frac{22}{7}$

$A = \pi r^2$

Combinations

$${}_nC_r = C(n,r) = \frac{n!}{r!(n-r)!}$$

Permutations

$${}_nP_r = P(n,r) = \frac{n!}{(n-r)!}$$

Distance Formula

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Quadratic Formula

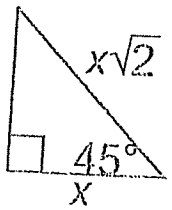
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

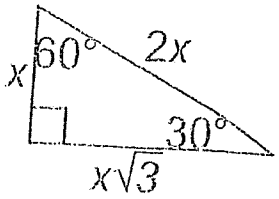
Trigonometry

$$\sin A = \frac{opposite}{hypotenuse}$$

$$\cos A = \frac{adjacent}{hypotenuse}$$

$$\tan A = \frac{opposite}{adjacent}$$





Ohio Diagnostic Test

1. Which of the following sets contains equivalent numbers?

   A. $\frac{9}{25}$ 0.35 35%
   B. $\frac{5}{16}$ 0.315 $31\frac{1}{2}\%$
   C. $\frac{3}{8}$ 0.375 $37\frac{1}{2}\%$
   D. $\frac{4}{5}$ 0.08 80%

   1E

2. Find the product of 7.5×10^{16} and 2.0×10^{4}. Write the answer in proper scientific notation without using a calculator?

   1I

3. For every 4 fish that Alice has in her pond, she must have five plants for them. If she only has 75 plants, what is the total number of fish she can have?

   A. 60
   B. 94
   C. 135
   D. 169

   1G

4. Simplify: $\sqrt{9}$

   A. 3
   B. 4
   C. 18
   D. 81

   1H

5. Simplify: $12 + (5 \times 2)^2 \times 14$

   A. 152
   B. 1412
   C. 1568
   D. 16,184

   1C

6. A recipe for 32 ounces of lemonade calls for 4 ounces of lemon juice. Janet wants to make 120 ounces of lemonade. Which proportion below should she use to find the amount of lemon juice needed?

   A. $\frac{32}{120} = \frac{x}{4}$
   B. $\frac{x}{32} = \frac{4}{120}$
   C. $\frac{32}{4} = \frac{x}{120}$
   D. $\frac{4}{32} = \frac{x}{120}$

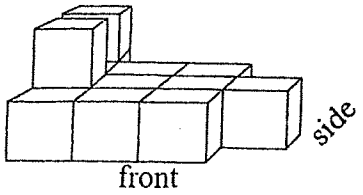
   1G

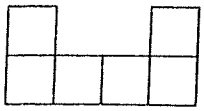
7. The price of a skateboard increased from \$32.80 to \$39.00. What is the approximate percentage of increase?

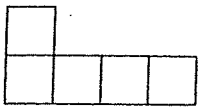
   A. 6%
   B. 8%
   C. 16%
   D. 19%

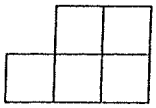
   1G

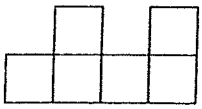
8. Below is shown a solid object constructed with cubes. Which of the following diagrams represents the side view of this object?



A. 

B. 

C. 

D. 

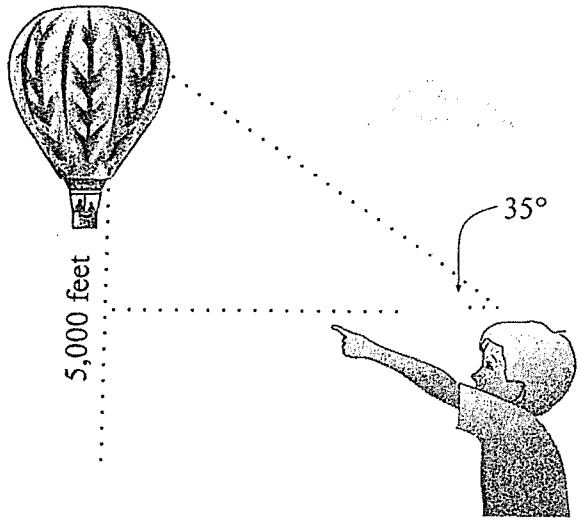
3E

9. A cylinder with radius 3 inches and height 10 inches is filled with liquid. The liquid is poured into a cylinder with radius 5 inches. What is the height of the liquid in the second cylinder?

A. 1.5 inches
B. 2.8 inches
C. 3.6 inches
D. 6 inches

2D

10. Harrison steps outside his house to see the hot air balloon pass by. He raises his eyes at a 35° angle to view the balloon. If the balloon is 5,000 feet above the ground, how far is it from Harrison.
HINT: Harrison's eye level is 5.2 feet from the ground.



A. 6100 feet
B. 8700 feet
C. 7100 feet
D. 2900 feet

3I

11. Consider the area of a square with sides of 20 inches each and the area of a circle with diameter 20 inches. Approximately how much smaller is the circle than the square?

A. 86 square inches
B. 136 square inches
C. 214 square inches
D. 228 square inches

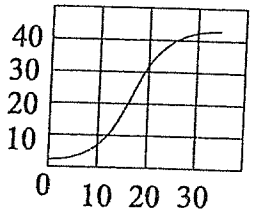
2C

12.

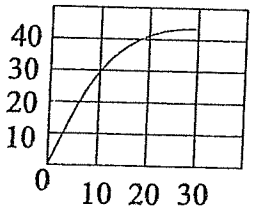
TIME IN MINUTES	NUMBER OF PEOPLE AT THE ART SHOW
0	12
10	22
20	32
30	42

Which of the graphs below represents the data in the table?

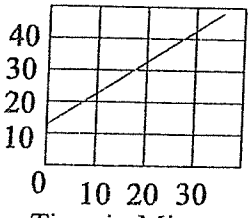
A.



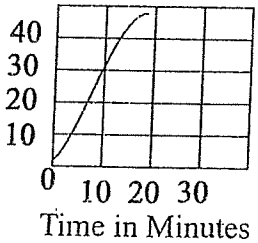
B.



C.

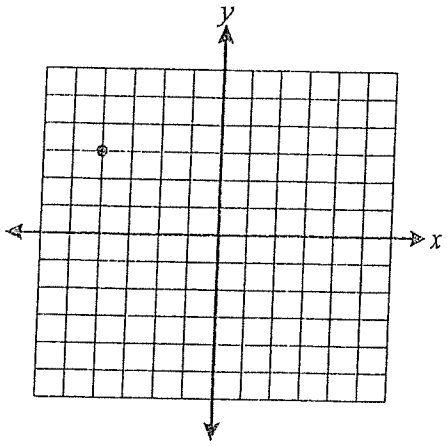


D.



5B

13. Charles plots the point (−4, 3) on a coordinate grid. He then reflects this point over the y-axis and translates it down 4 units.



What are the coordinates of the new point?

A. (−4, −1)
B. (−4, 1)
C. (4, −1)
D. (4, 1)

3F

14. In a game using two numbered cubes, what is the probability of *not* rolling the same number on both cubes in three consecutive rolls?

A. $\frac{125}{256}$

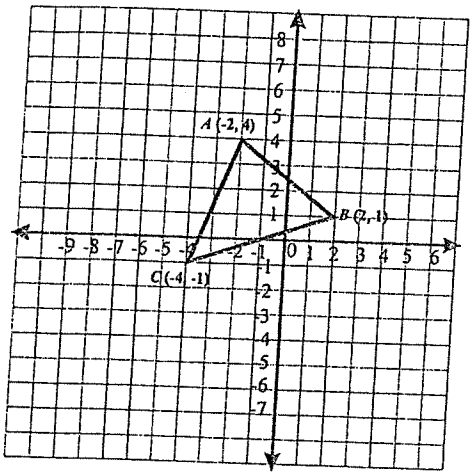
B. $\frac{125}{216}$

C. $\frac{27}{64}$

D. $\frac{16}{27}$

5J

15. Ann is enlarging a triangular design. Triangle ABC is to be enlarged with a scale factor of 2 centered at the origin.



Explain in words how the coordinates of the vertices of the new enlarged triangle can be determined from the original coordinates of points A, B, and C.

Sketch the enlarged triangle, and label the vertices with appropriate coordinates.

3F

16. Aaron is making 100 circular signs, each with a diameter of 30 inches. The weight of the material from which the signs are made is 0.1 ounce per square inch. Which of the following is most nearly the weight of all 100 signs?

A. 70 pounds
B. 450 pounds
C. 700 pounds
D. 1750 pounds

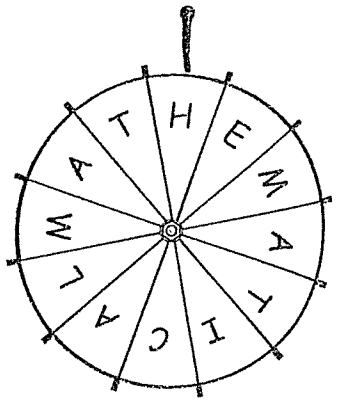
2C

17. There are 8 people at a party and each person shakes hands with each other person. How many handshakes is that?

A. 28
B. 32
C. 56
D. 64

5H

18. Dawn made a spinning game wheel for the math and science exhibit.



Assume that the wheel is a fair wheel. That is, all 12 segment outcomes are equally likely.

What is the theoretical probability that the wheel will stop on a vowel on the next spin?

What is the probability that the wheel will stop on a vowel on each of the next three spins?

5I

19. The weights of 8 puppies are 10 pounds, 10 pounds, 11 pounds, 8 pounds, 11 pounds, 13 pounds, 6 pounds, 11 pounds. What are the mean, median, and mode of these weights?

	mean	median	mode
A.	9.5	10.5	10.0
B.	10.5	10.0	11.0
C.	10.0	11.0	10.5
D.	10.0	10.5	11.0

5D

20. In a game using two numbered cubes and rolling them twice, what is the probability of rolling 12 on both rolls?

A $\frac{1}{12}$

B. $\frac{1}{72}$

C. $\frac{1}{1296}$

D. $\frac{1}{1728}$

5J

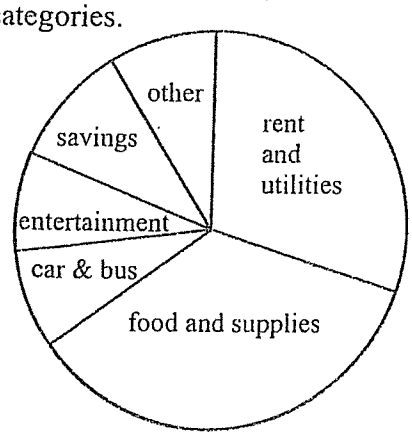
21. What are the roots of the quadratic equation below?

$$x^2 - 2x - 24$$

A. (–8, 6)
B. (–6, 4)
C. (–6, –4)
D. (–8, 3)

4G

22. The graph shows the percentage of a family's net income spent in various categories.



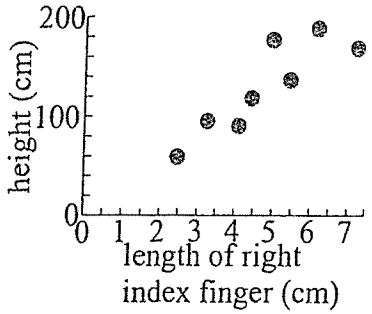
If the family's annual net income is $26,723, approximately how much is spent on rent and utilities in one year?

A $9,000
B. $11,000
C. $14,000
D. $17,000

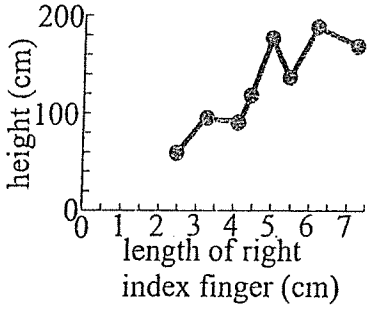
5A

23. Which of the following charts would be most useful in predicting height as a function of finger length?

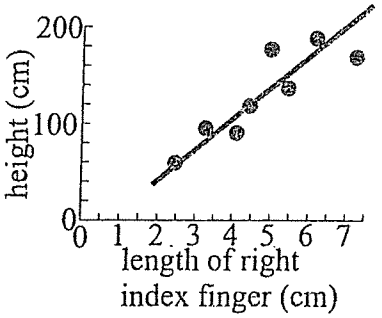
A.



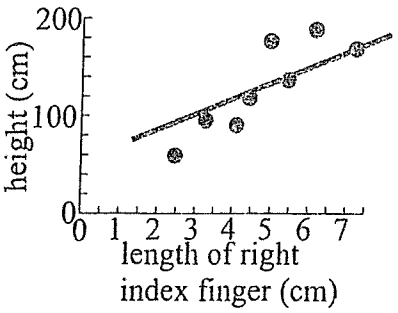
B.



C.



D.



5E

24. Jacob has had a new job for 6 weeks and has received a bonus in his paycheck each week. He has not been told how the amount of the bonus is computed, but he notices a pattern.

Week	1	2	3	4	5	6	7
Bonus	$11	$12	$14	$17	$21	$26	

Based on the pattern in the table above, what bonus could Jacob expect to receive in week 7?

A. $29
B. $30
C. $31
D. $32

4A

25. Which equation represents the pattern shown in the table?

x	−3	−2	−1	0	1	2	3
y	−30	−8	0	0	−2	0	12

A. $y = x^3 - x^2 - 2x$
B. $y = x^3 + x^2 - 2x$
C. $y = x^3 - 2x^2 - 3x$
D. $y = x^3 - 4x$

4C

26. The formula $F = \frac{9}{5}C + 32$ relates degrees Celsius (°C) to degrees Fahrenheit (°F). If the temperature rose 45°C, this would be equivalent to an increase of how many degrees Fahrenheit?

A. 25°F
B. 77°F
C. 81°F
D. 113°F

4D

27. Debra is making a string of 92 beads for her great grandmother's 92nd birthday. She is using six colors of beads: Red, Orange Yellow, Green, Blue, and Violet. The six colors are arranged in the repeating pattern shown below.

What will be the color of the last bead (the 92nd bead) on the string?

Show the calculation and explain the logic of the solution.

4A

28. There are a total of 24 cats and dogs at the animal shelter. There are 3 times as many dogs as cats. How many cats are there?

A. 6
B. 8
C. 16
D. 18

4D

29. The sign below is posted over the service counter in a repair shop.

Hours	1	2	3	4	5	6
Cost	$35	$60	$85	$110	$135	$160

Write an algebraic equation that relates hours and cost.

You receive a bill for $585.

Use the equation to determine the number of hours this represents.

4C, 4F

30. A building lot is 72 feet wide by 96 feet long. If the length of the lot on a landscape designer's drawing is 4 inches, what will the width of the lot be on the drawing?

A. 3 inches
B. 4 inches
C. 5 inches
D. 6 inches

2D

31. If $y = 6$ and $x = 4$, what is the value of y when $x = 8$ if this represents an indirect variation?

A. 4

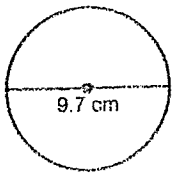
B. 12

C. 3

D. 8

4I

32. Which of these will provide the best estimate of the area of this circle?



A. $3^2 \times (10 \div 2)$

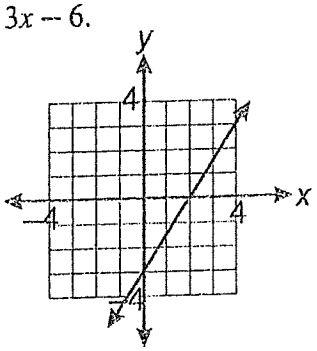
B. $3 \times (10 \div 2)^2$

C. 3×10^2

D. $(3 \times 10)^2$

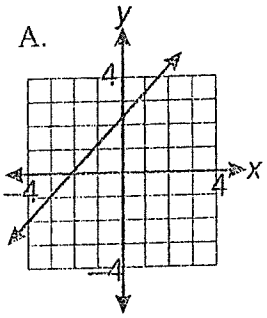
2E

33. The graph represents the equation $2y = 3x - 6$.

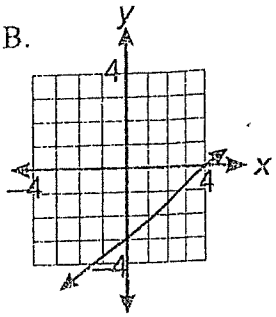


If the constant term changes from –6 to 4, what will the graph look like?

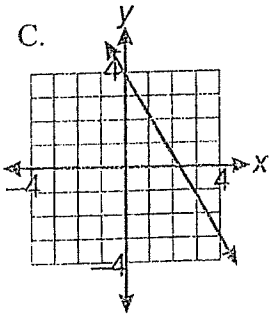
A.



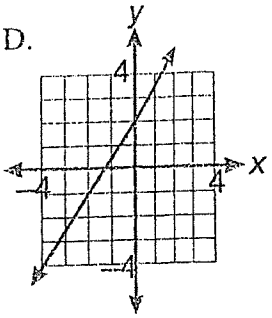
B.



C.

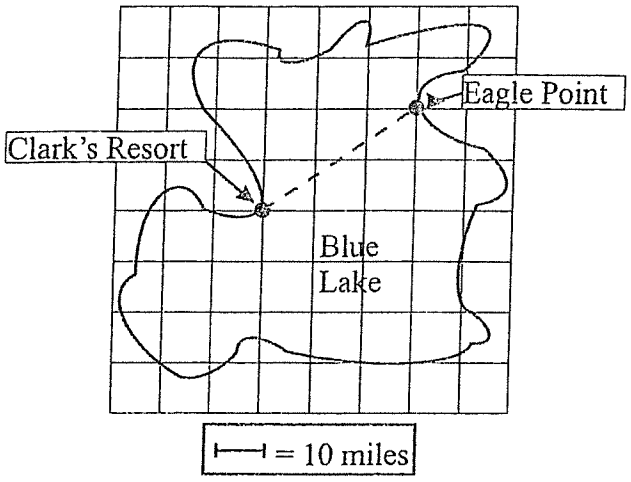


D.



4E

34. Brent and Andrew are training, preparing to someday swim the English Channel. They swam across Blue Lake from Eagle Point to Clark's Resort. Approximately how far did they swim?



A. 20 miles
B. 30 miles
C. 40 miles
D. 50 miles

3G

35. It is 65°F outside, but tomorrow it is predicted to be 81°F. What is the difference between the temperature today and tomorrow?

A. −16°F
B. 6°F
C. 16°F
D. Cannot be determined

2F

36. Sally is seven years old and goes to the store with her mother every Saturday morning. Every time they go, she notices that her mother gives the check out clerk money before they leave the store. Sally concluded that everyone has to give money in exchange for things they want to take out of the store. This is an example of

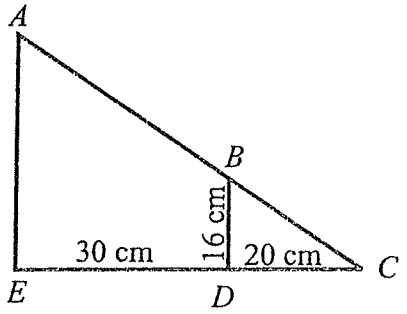
A. deductive reasoning.
B. inductive reasoning.
C. analytical reasoning.
D. none of the above.

3H

37. If you double the radius of a circle, how much does the area increase?

2D

38. In the triangles below, ΔACE is similar to ΔBCD. What is the measure of $\overline{AE}$?



A. 70 cm
B. 60 cm
C. 24 cm
D. 40 cm

3B

Algebra
WEEK 2
Day
4.5

CHAPTER 16 REVIEW

Find the mean, median, and mode for each of the following sets of data. Fill in the table below.

❶ Miles Run by Track Team Members	
Jeff	24
Eric	20
Craig	19
Simon	20
Elijah	25
Rich	19
Marcus	20

❷ 1992 SUMMER OLYMPIC GAMES Gold Medals Won			
Unified Team	45	Hungary	11
United States	37	South Korea	12
Germany	33	France	8
China	16	Australia	7
Cuba	14	Japan	3
Spain	13		

❸ Hardware Store Payroll June Week 2	
Erica	$280
Dane	$206
Sam	$240
Nancy	$404
Elsie	$210
Gail	$305
David	$280

Data Set Number	Mean	Median	Mode
❶			
❷			
❸			

4. Jenica bowled three games and scored an average of 116 points per game. She scored 105 on her first game and 128 on her second game. What did she score on her third game?

5. Concession stand sales for each game in the season were $320, $540, $230, $450, $280, and $580. What was the mean sales per game?

6. Cedrick D'Amitrano works Friday and Saturday delivering pizza. He delivers 8 pizzas on Friday. How many pizzas must he deliver on Saturday to average 11 pizzas per day?

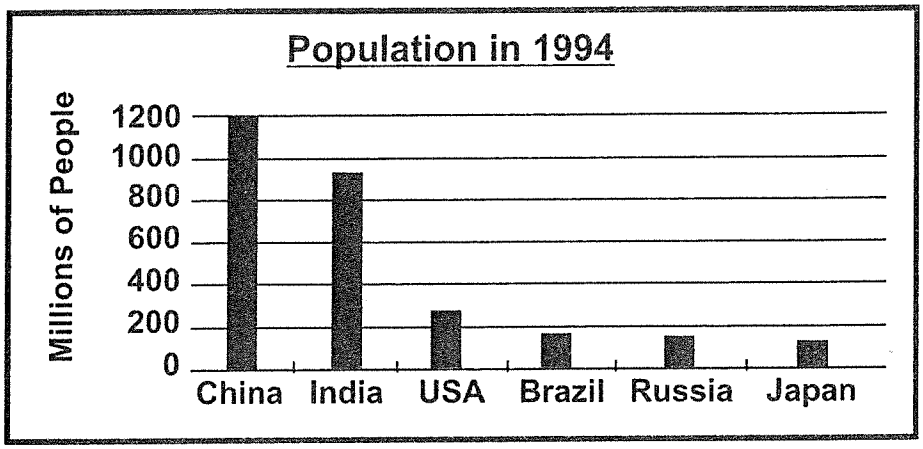
7. Long cooked three Vietnamese dinners that weighed a total of 40 ounces. What was the average weight for each dinner?

8. The Swamp Foxes scored an average of 7 points per soccer game. They scored 9 points in the first game, 4 points in the second game, and 5 points in the third game. What was their score for their fourth game?

9. Shondra is 66 inches tall, and DeWayne is 72 inches. How tall is Michael if the average height of these three students is 77 inches?

BAR GRAPHS

Bar graphs can be either vertical or horizontal. There may be just one bar or more than one bar for each interval. Sometimes each bar is divided into two or more parts. In this section, you will work with a variety of bar graphs. Be sure to read all titles, keys, and labels to completely understand all the data that is presented. **Answer the questions about each graph below.**

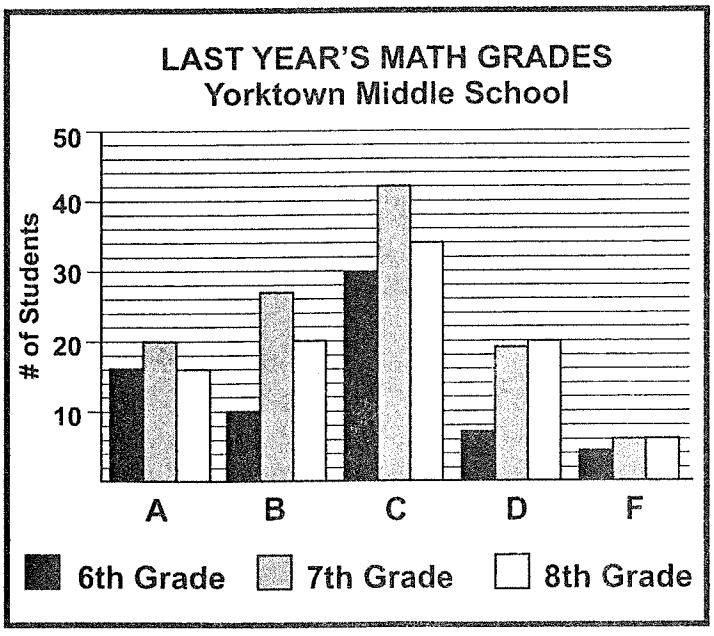


1. Which country has over 1 billion people? _____

2. How many countries have fewer than 200,000,000 people? _____

3. How many more people does India have than Japan? _____

4. If you added together the populations of the USA, Brazil, Russia, and Japan, would it come closer to the population of India or China? _____



5. How many of last year's 6th graders made C's in math? _____

6. How many more math students made B's in the 7th grade than in the 8th grade? _____

7. Which letter grade is the mode of the data? _____

8. How many 8th graders took math last year? _____

9. How many students made A's in math last year? _____

MULTIPLE LINE GRAPHS

Multiple line graphs are a way to present a large quantity of data in a small space. It would often take several paragraphs to explain in words the same information that one graph could.

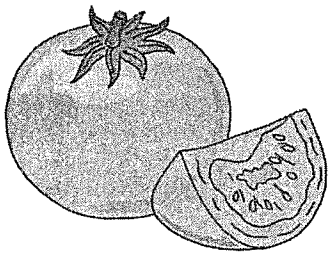
On the graph below, there are three lines. You will need to read the **key** to understand the meaning of each.

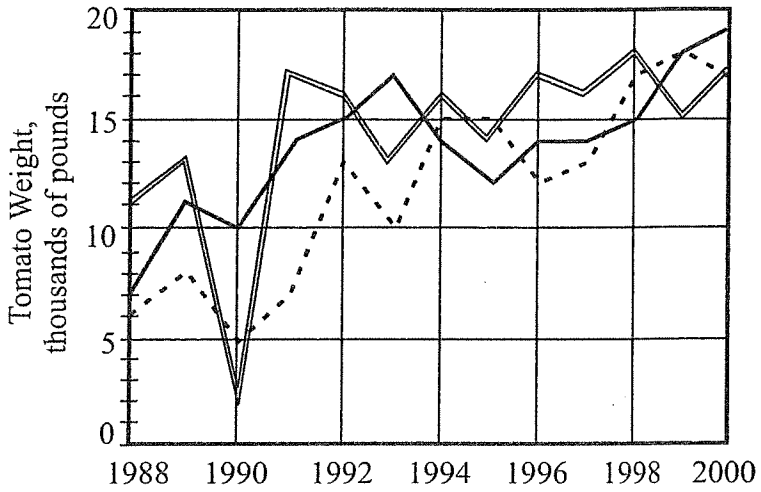
TOMATO PRODUCTION

Dayville County 1988 - 2000

KEY

- - - - - - - Jefferson's Farm
——— Barnwell's Farm
═══ Talbot's Farm





Study the graph, and then answer the questions below.

1. In what year did Barnwell's Farm produce 8,000 pounds of tomatoes more than Talbot's Farm? _____

2. In which year did Dayville County produce the most pounds of tomatoes? _____

3. In 1993, how many more pounds of tomatoes did Barnwell's Farm produce than Talbot's Farm? _____

4. How many pounds of tomatoes did Dayville County's three farms produce in 1992? _____

5. In which year did Dayville County produce the fewest pounds of tomatoes? _____

6. Which farm had the most dramatic increase in production from one year to the next? _____

7. How many more pounds of tomatoes did Jefferson's Farm produce in 1992 than in 1988? _____

8. Which farm produced the most pounds of tomatoes in 1995? _____

Find the probability of the following problems. Express the answer as a fraction.

1. Prithi has two boxes. Box 1 contains 3 red, 2 silver, 4 gold, and 2 blue combs. She also has a second box containing 1 black and 1 clear brush. What is the probability that Prithi selected a red brush from box 1 and a black brush from box 2?

2. Terrell cast his line into a pond containing 7 catfish, 8 bream, 3 trout, and 6 northern pike. He immediately caught a bream. What are the chances that Terrell will catch a second bream when he casts his line?

3. Gloria Quintero entered a contest in which the person who draws his or her initials out of a box containing all 26 letters of the alphabet wins the grand prize. Gloria reaches in and draws a "G", keeps it, then draws another letter. What is the probability that Gloria will next draw a "Q"?

4. Steve Marduke had two spinners in front of him. The first one was numbered 1–6, and the second was numbered 1–3. If Steve spins each spinner once, what is the probability that the first spinner will show an odd number and the second spinner will show a "1"?

5. Carrie McCallister flipped a coin twice and got heads both times. What is the probability that Carrie will get tails the third time she flips the coin?

6. Vince Macaluso is pulling two socks out of a washing machine in the dark. The washing machine contains three tan, one white, and two black socks. If Vince reaches in and pulls the socks out one at a time, what is the probability that Vince will pull out two tan socks in his first two tries?

7. John Salome has a bag containing 2 yellow plums, 2 red plums, and 3 purple plums. What is the probability that he reaches in without looking and pulls out a yellow plum, eats it, reaches in again without looking, and pulls out a red plum to eat?

8. Artie Drake turns a spinner which is evenly divided into 11 sections numbered 1–11. On the first spin, Artie's pointer lands on "8." What is the probability that the spinner lands on an even number the second time he turns the spinner?

9. Leanne Davis played a game with a street entertainer. In this game, a ball was placed under one of three coconut halves. The vendor shifted the coconut halves so quickly that Leanne could no longer tell which coconut half contained the ball. She selected one and missed. The entertainer then shifted them around once more and asked Leanne to pick again. What is the probability that Leanne will select the coconut half containing the ball?

10. What is the probability that Jane Robelot reaches into a bag containing 1 daffodil and 2 gladiola bulbs and pulls out a daffodil bulb, and then reaches into a second bag containing 6 tulip, 3 lily, and 2 gladiola bulbs and pulls out a lily bulb?

Day 1-5 Week 2 Language Arts

Just for Teens: A Personal Plan for Managing Stress

WHAT IS STRESS?

Stress is the uncomfortable feeling you get when you're worried, scared, angry, frustrated, or overwhelmed. It is caused by emotions, but it also affects your mood and body. Many adults think that teens don't have stress because they don't have to work and support a family. They are missing the point and are wrong!

WHAT CAUSES STRESS?

Stress comes from many different places.

- *From your parents.* "Don't disappoint me, clean up, hurry up, finish this, do your homework, go out for the team, practice your music, try out for the school play, do your best, stay out of trouble, make more friends, don't ever try drugs."
- *From your friends.* "How'd you do on the test, try this, prove you're not a loser, don't hang out with them, don't wear that."
- *Even from yourself.* "I need to lose weight, build my muscles, wear the right clothes, get better grades, score more goals, show my parents I'm not a kid anymore."

And from

- Watching parents argue
- Figuring out how to be independent
- Feeling pressure to get good grades
- Thinking about the future
- Being pressured to do something you know is bad for you, like smoking
- Not being good enough at sports
- Worrying about how your body's changing
- Dealing with sexual feelings
- Worrying about neighborhood or world problems
- Feeling guilty

HOW DOES THE BODY HANDLE STRESS?

First, here are 2 short definitions.

- *Hormone:* a chemical made by one part of the body that travels through your blood to send messages to the rest of the body.
- *Nervous system:* the brain, spinal cord, and all of the nerves. The nerves send messages between your brain and the rest of your body.

The body is a finely tuned machine that can change quickly to do what we need it to do, like react to stress. The body has 2 nervous systems. The voluntary system does what you choose to have it do—walk, talk, move. The involuntary system keeps the body running without your even thinking about it—breathe, sweat, digest. The body actually has 2 different nerve pathways in the involuntary system. One works while we're relaxed, and the other works when there's an emergency. These 2 systems can't work together at the same time. It's important to know this because we can shut off the emergency system by flipping a switch and turning on the relaxed system.

IS STRESS ALWAYS BAD?

Even though stress is uncomfortable, it's not always a bad thing. Sometimes stress helps us deal with tough situations. A lot of stress changes our bodies quickly and helps us react to an emergency. A little stress keeps us alert and helps us work harder.

Ages ago, when people lived in the jungle—where a tiger might leap out at any moment—the emergency nervous system was key to survival. Imagine your great, great, great ancestors, Sam and Zelda, munching on some berries. Suddenly they saw a tiger and had to *run!* Hormones gave them the burst of energy they needed to escape.

How did their bodies react? First, Sam and Zelda got that sinking feeling in their stomachs as the blood in their bellies quickly went to their legs so they could take off. When they jumped to their feet, their hearts beat faster to pump more blood. As they ran from the tiger, they breathed faster to take in more air. Their sweat cooled them as they ran. Their pupils became bigger so they could see in the dark, in case they needed to jump over a log while running away. They didn't think about anything but running because they weren't supposed to stop and figure out a friendly way to work it all out with the tiger.

Our ancestors never would have survived without the stress reaction, but stress helps us do more than run. It keeps us alert and prepared for the next lurking tiger.

Few of us need to outrun tigers today, but we all have problems and worries that turn on some of those exact same stress responses, like that panicky feeling you sometimes get when you're studying for a big test. Your heart beats fast. Your breathing becomes heavier. You sweat and get flashes of heat because your hormones are confused about why you aren't listening to them.

(1) Read entire packet
(2) Complete the My Personal Stress plan, Stress worksheet and last page

Why are you standing still when they are telling you to run?

IF STRESS IS A SURVIVAL TOOL, WHY DOES IT MAKE US FEEL AWFUL?

Sam and Zelda had few choices when the tiger chased them. Either the tiger ate them or they escaped. As sick as it sounds, if they'd been eaten, they wouldn't have had much to worry about anymore, right? If they lived, you can be sure their burst of energy allowed them to outrun the tiger or at least outrun Zok (their slower friend who was eaten by the tiger). In their run for survival, Sam and Zelda used up every drop of their hormone burst and then took a well-deserved nap.
In the modern world, our biggest worries aren't usually about life or death. We don't really have to run away from our problems. But those same stress hormones stay in our bodies because, unlike Sam and Zelda, we don't use them up by running. Instead, those hormones continue to hang around, unused and confused. They seem to be asking, "Why did my body stand still when that 'tiger' attacked?"

It would be better if we had different hormones for different stresses. Hormones to deal with parental pressure would make you love chores. Hormones related to school stress would make you focus longer and shut down your kidneys so you wouldn't need bathroom breaks. But we only have those hormones that prepare us to flee or fight. So it's really important to use your brain to decide what's a real emergency and to use exercise to use up those hormone bursts.

Even when there are no real emergencies, our emotions make our bodies act like there is a huge crisis because the brain controls emotions and stress hormones. If your brain thinks something terrible is happening, your body will react as if it really is! Even a little bit of stress that never seems to go away can confuse the body. It makes the body work harder to prepare for an emergency that may not really be there.

A tiger running at you is a real crisis. If you believe a mild stress (like a math test) is an emergency, you will not be able to study. Your body will be preparing to deal with a real tiger, and you won't be able to concentrate on anything but escaping. The trick is to figure out when something really is an emergency and when your emotions are only treating it like one.

A REVIEW

- Stress is an important survival tool and can keep you alert and focused. But when you're not dealing with a real survival issue, it can make you uncomfortable and interfere with your ability to think through the problem.
- Stress hormones are telling us to run, so exercise uses them up.
- The body reacts to stress when the brain tells the body to prepare for an emergency.
- Emotions play an important role in how our bodies experience stress. How we think about a stressful situation and what we choose to do about it affects how it makes us feel.

HOW DO PEOPLE DEAL WITH STRESS?

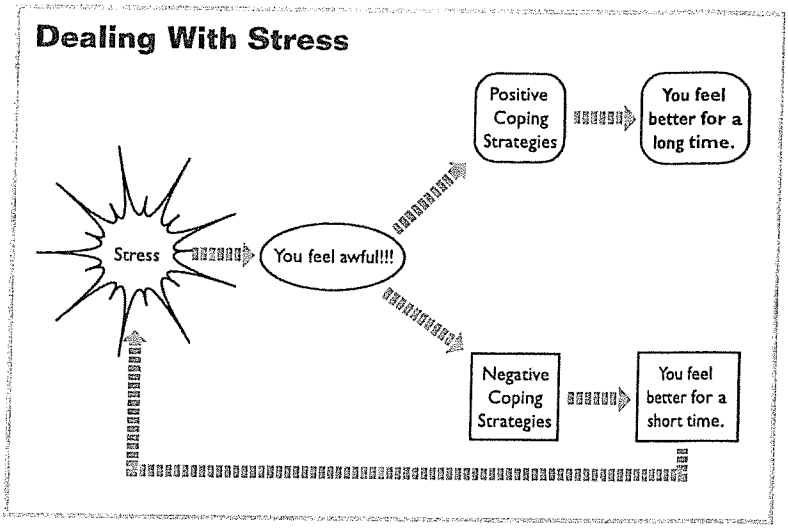
Nobody can avoid all stress, but you can learn ways to deal with it. When you are stressed, it is normal to want to feel better. Anything that makes you feel better is called a *coping strategy.* Negative strategies can be quick fixes, but they're harmful because they can be dangerous and make stress worse in the long run. Think about some of the ways people cope with stress that can really hurt them.

- Drugs
- Cigarettes
- Alcohol
- Bullying
- Fighting
- Sex
- Cutting/self-mutilation
- Skipping school
- Eating disorders
- Running away
- Isolating themselves or withdrawal
- Gangs

DEALING WITH STRESS

These harmful choices may help you feel good for a little while, but some can be really dangerous. They also end up making people worried about you or angry with you. This messes up your life, and you become a lot more stressed. They're especially worrisome if they are a major way you deal with stress because you may turn to these behaviors more often during hard times. This is one of the ways addiction starts. If you are doing some of these things, ask yourself, "Why?" If it is to deal with problems, consider other ways of dealing with the same problems.

There are many healthy ways of coping. Healthy coping strategies are safe and can help you feel better without messing up your life.



CREATING YOUR PERSONAL STRESS-MANAGEMENT PLAN

Following is a 10-point plan to help you manage stress. All of these ideas can lower stress without doing any harm. None are quick fixes, but they will lead you toward a healthy and successful life. The plan is divided into 4 parts.

1) Tackling the problem
2) Taking care of my body
3) Dealing with emotions
4) Making the world better

When you read over the plan, you'll notice that you can come up with a bunch of ideas for each point. PLEASE don't think you should try them all. This plan is supposed to help you reduce stress, not give you more. Try out some ideas, then stick to 1 or 2 ideas for each point.

You might notice that this plan is almost like building a college or work résumé. This is the sane way to build a résumé; you are doing it to manage your life and remain happy and prepared for success, not to cram in activities to impress someone else. It will ensure you're healthy and balanced, and that's very attractive to colleges and employers.

PART 1: TACKLING THE PROBLEM

Point 1: Identify and Address the Problem.

First decide if a problem is a real tiger or just feels like one. If it can't physically hurt you, chances are that it can be better handled with clear thinking. This means turning off those thoughts that make you interpret the situation as a disaster.

1) A lot of people cope by ignoring problems. This doesn't make them go away; usually they just get worse.
2) People who cope by trying to fix problems tend to be emotionally healthier.
3) When it comes to studying or chores, it is best to get the work done first. Because work or studying produces stress, many people put it off and choose to do fun things first. The problem with that is they're not really having fun because they're worrying about the work they're ignoring. And of course, the longer they put it off, the more they worry. The cycle is endless.
4) Fights with parents and friends don't go away unless you deal with what upset you in the first place or unless everyone apologizes and decides to forgive each other.

Three ideas can help you manage a lot of work.

1) Break the work into small pieces. Then do one small piece at a time, rather than look at the whole huge mess. As you finish each piece, the work becomes less overwhelming.
2) Make lists of what you need to do. This will help you sleep because your head won't spin with worry about whether you can do everything. At the end of the day, you'll have less to worry about as you check off the things you have finished. You will look at the same huge amount of work and realize you can handle it.
3) Timelines can help with big projects.

Point 2: Avoid Stress When Possible.

Sometimes we know exactly when we are headed for trouble. Avoiding trouble from a distance is easier than dealing with it up close. You know the people who might be a bad influence on you, the places where you're likely to get in trouble, and the things that upset you. Choose not to be around those people, places, and things that mess you up.

Point 3: Let Some Things Go.

It's important to try to fix problems, but sometimes there is nothing you can do to change a problem. For example, you can't change the weather, so don't waste your energy worrying about it. You can't change the fact that teachers give tests, so just study instead of complaining about how unfair they are. You can't change the fact that your parents need to know where you go, so prove that you're responsible and deserve more freedoms. People who waste their energy worrying

about things they can't change don't have enough energy left over to fix the things they can. Also learn when not to take things personally. You feel badly for no reason when you take something personally that really has little to do with you.

PART 2: TAKING CARE OF MY BODY

Point 4: The Power of Exercise

Exercise is the most important part of a plan to manage stress. When you are stressed, your body is saying, "Run!" So do it. Exercise every day to control stress and build a strong, healthy body. You may think you don't have time to exercise when you are most stressed, but that is exactly when you need it the most. If you are stressed about an assignment but too nervous to sit down and study—exercise! You will be able to think better after you have used up those stress hormones. Some people exercise before school because they can focus and learn better.

Point 5: Active Relaxation

You can flip the switch from being stressed to relaxed if you know how to fool your body. Because your body can only use the relaxed or emergency nervous system at any one time, you can turn on the relaxed system. You do this by doing the opposite of what your body does when it is stressed. Here are 2 ideas.

1) Breathe deeply and slowly. Try the 4–8 breathing technique. Lie on your back and place your hands on your belly with your fingers loose. Deep breaths first fill the belly, then the chest, then the mouth; the breath expands the belly and your hands pull gently apart. Take a full breath while counting to 4. Then hold that breath for about twice as long, or an 8 count. Slowly let it out to the count of 8, or even longer if you can. This will relax your body after a few breaths, but just as importantly, it requires your full concentration. Your mind is too focused on breathing to also focus on worries. Do this 10 times and you will feel much more relaxed. Yoga, martial arts, and meditation also teach great breathing skills. When you get good at this, you can even do this in a chair during a test and nobody will know.
2) Put your body in a relaxed position.
   - Your body knows when you're nervous. If you sit down to take a test and your legs are shaking, you are saying, "I want to run!" Remember, you can't concentrate and run at the same time, so you are making it harder to take the test. Instead, take those deep breaths, lean back, and tell your body there is no emergency.
   - When you're angry, the natural thing to do is stand up and face someone shoulder-to-shoulder and chest-to-chest. You do this without even thinking, but this subconsciously tells the other person that you're angry and ready to fight. It also may prevent you from thinking clearly. Do the *opposite* of what you would do if you were really going to fight—sit down, take deep slow breaths, and tell your body there is no danger. Then use your brain to get out of the situation.

Point 6: Eat Well.

Everyone knows good nutrition makes you healthier. Only some people realize that it also keeps you alert through the day and your mood steady. People who eat mostly junk food have highs and lows in their energy level, which harms their ability to reduce stress. Instead of eating greasy or sugary foods, eat more fruits, vegetables, and whole grains—they keep you focused for a longer time. Go to www.ChooseMyPlate.gov to learn more.

Point 7: Sleep Well.

Most kids don't get the sleep they need to grow and think clearly. Tired people can't learn as well and can be impatient and irritable. Here are some ideas to improve your sleep.

- Go to sleep about the same time every night.
- Exercise 4 to 6 hours before bedtime. Your body falls asleep most easily when it has cooled down. If you exercise right before bed, you will be overheated and won't sleep well. A hot shower 1 hour before bedtime also helps your body relax to fall asleep.
- Use your bed only to sleep. Don't solve your problems in bed. When you think about all the things that bother you, you have trouble falling asleep and wake up in the middle of the night to worry more. Instead, have another spot to think, like a *worry chair.* Give yourself plenty of time to think things through, make a list if you need to, and then *set it aside!* Go to bed to sleep.
- Don't do homework, watch television, read, or use the phone while in bed.

PART 3: DEALING WITH EMOTIONS

Point 8: Take Instant Vacations.

Sometimes the best way to de-stress is to take your mind away to a more relaxing place.

1) *Visualize.* Have a favorite place where you can imagine yourself relaxing. The place should be beautiful and calm. When you're stressed, sit down, lean back, take deep breaths, close your eyes, and imagine yourself in your calm place.
2) *Take time out for yourself.* Everyone deserves time for themselves—a bath or something that allows time to think and de-stress. Try a warm bath with your ears just underwater. Listen to yourself take deep, slow breaths. Take your pulse and count as your heart rate goes down.
3) Enjoy *hobbies* or creative art as an instant vacation.
4) Look at the beauty around you and get *pleasure from the small things* you may have stopped noticing.
5) Take *mini-vacations.* Sometimes we forget that the park around the corner is a great place to hang out. A walk outside can be a mini-vacation if you choose to forget your worries.
6) *Reading* a good book is an escape from reality. You have to imagine the sights, sounds, and smells—you are somewhere else for a while.

Point 9: Release Emotional Tension.

Sometimes feelings become so overwhelming that we cram them all away in an imaginary box and think we'll deal with them later. But later, there's so much stuff in the box that there is too much to deal with. This can make your head feel as if it is spinning. Sometimes you get angry or frustrated without even knowing why. You just know there is too much stuff going on in your head. It's good to pick just one problem to work on and forget the rest for the moment. When we decide to deal with only one problem at a time, it's much less scary to open the box.

Here are some ideas to release your thoughts or worries one at a time.

- **Creativity.** People who have a way to express themselves don't need to hold it inside. Creative outlets like art, music, poetry, singing, dance, and rap are powerful ways to let your feelings out.
- **Talking.** Every young person deserves a responsible adult to talk to and some friends to trust. Hopefully, you can talk to your parents. If you do not want to tell your parents everything, make sure to find an adult who'll listen and whom you can ask for advice.
- **Journaling.** Write it out!
- **Prayer.** Many young people find prayer or meditation helpful.
- **Laughing or crying.** Give yourself permission to feel your emotions fully.

PART 4: MAKING THE WORLD BETTER

Point 10: Contribute to the World.

Young people who work to make the world better have a sense of purpose, feel good about themselves, and handle their own problems better. It's important to understand that you really can make a difference in other people's lives. The role of teenagers is to recognize the mistakes adults have made and build a better world.

* * * *

Now that you have read about the kind of things a person can do to reduce stress, you may be ready to create a plan for yourself. Just check off the ideas you think would work best for you. There are spaces for you to write down your own ideas.

My Personal Stress Plan

PART 1: TACKLING THE PROBLEM

Point 1: Identify and Address the Problem.

When I have too many problems, I will work on just one at a time. For example, I am going to pick one huge problem and break it into smaller pieces.

- I will seek advice from family members and learn from their experience how to better handle problems.
- I will take big assignments and learn to make lists or timelines.
- I will work in teams so that I will learn that when people work well together they can do much more than if they each work alone.

Point 2: Avoid Stress When Possible.

I know that everyone has stress, but there are things that I could stay away from that really stress me out. I will

- Avoid certain people, like_____
- Avoid certain places, like _____
- Avoid certain things, like _____
- Avoid certain memories that create pain for me, like _____

Point 3: Let Some Things Go.

I realize that I waste some of my energy worrying about things I can't fix. Here are some things that I will try to let go so I can focus on the problems I can change.

- _____
- _____
- _____

I know I waste some of my energy when I take things personally that really have nothing to do with me. I am going to learn this lesson by remembering a time I did this and by choosing not to repeat that mistake.

_____

_____

_____

_____

_____

_____

_____

PART 2: TAKING CARE OF MY BODY

Point 4: The Power of Exercise

I will do something that makes my body work hard for at least 20 minutes every other day—more is better. I know that strong bodies help people better deal with stress, and this will keep me in shape. The kinds of things I like to do include

- _____
- _____
- _____

I can commit to _____ minutes of exercise a day. If I have trouble focusing in school, I will try exercising before school for _____ minutes (recommended minimum: 20) to see if it helps me concentrate better.

I know that a really hard physical workout will help me calm down when I am feeling most worried, stressed, or fearful. This is especially true when I can't concentrate on my homework because it feels like too much. The kinds of things I might do include

- _____
- _____
- _____

Point 5: Active Relaxation

I will try to teach my body to relax by using

- Exercise that controls the body and releases tension like tai chi or boxing.
- Deep breathing.
- Yoga.
- Meditation.
- Warm, long baths or showers.
- Imagine I am someplace peaceful and relaxing. The place I could imagine myself being is

_____

Point 6: Eat Well.

I know that having a healthy body helps people deal with stress better. I have already agreed to exercise more. I understand that good nutrition also makes a difference in my health and how well I deal with stress. The changes I am ready to make include

- Eating a good breakfast
- Skipping fewer meals
- Drinking fewer sodas and sugary drinks
- Drinking more water
- Eating smaller portions
- Eating less greasy meals or snacks
- Eating more fruits, vegetables, and whole-grain foods
- Going to www.ChooseMyPlate.gov to learn more
- _____
- _____

Point 7: Sleep Well.

I know that people who get a good night's sleep do a better job of dealing with stress and do better in school. For me to get the sleep I need, I will try to go to bed at ____:____.

I will consider the following plan to help me get the best night's rest:

- Avoid caffeine at least 6 hours before bed.
- Exercise 4 to 6 hours before bed.
- Finish homework after exercise because I will be my calmest, clearest, and most focused.
- Take some time to relax or hang out after homework.
- Shower or bathe 1 hour before bed.
- Begin to dim the lights 30 minutes before bed.
- Let go of my emotional tension before bed in a place other than bed (see point 9). If I am really troubled, I will do this earlier in the evening.
- I will use my bed only for sleeping. I will use another place to do some of the things I do in bed now. I will
  - —Stop reading in bed.
  - —Stop doing homework in bed.
  - —Stop watching television in bed.
  - —Stop talking to my friends or instant messaging in bed.
  - —Stop worrying in bed.
- Dock my cell phone in a charger that is not in my bedroom.
- Deal with the things that stress me out by having a time to let go of my thoughts and feelings in a place other than my bed.

PART 3: DEALING WITH EMOTIONS

Point 8: Take Instant Vacations.

Everyone needs to be able to escape problems for a while by taking an instant vacation. I will

- Read a book.
- Take a mini-vacation to a local park or recreation center.
- Imagine I am someplace peaceful and relaxing. The place I could imagine myself being is _____

_____

- Watch television.
- Listen to music.
- Play video games that are not violent or stressful.
- Take a warm bath.
- _____

Point 9: Release Emotional Tension.

I will try to let my worries go, rather than letting them build up inside.

- I will talk to a friend I have chosen wisely because I know he or she will give good advice.
- I will talk to my
  —Mother
  —Father
  —Teacher
  —_____
- I will ask my parents or a teacher to help me find a counselor to help me work out my problems.
- I will pray to gain strength.
- I will meditate.
- I will write out my thoughts in a diary, journal, or blog.
- I will let myself laugh more.
- I will let myself cry more.
- I will make lists to get organized.
- When it seems that I have too many problems and they seem like more than I can handle, I will work on one at a time.
- I will express myself through
  —Art
  —Music
  —Creative writing
  —Poetry
  —Rap
- _____
- _____

PART 4: MAKING THE WORLD BETTER

Point 10: Contribute to the World.

I know that people who realize they are needed feel better about themselves because they can make a difference in other people's lives. I plan to

- Help a member of my family by _____
- Volunteer in my community by _____
- Help the environment (or animals) by

_____

WHEN TO TURN FOR HELP

Even if you are great at dealing with problems, there may be times when stress feels like it is getting to you. You are not alone. This does not mean you are crazy or a failure. Strong people turn to others for support when they have too much to handle. It's OK to turn to wise friends for advice, but it is also important to turn to your parents or another adult to help you. Nobody will solve your problems; they might just help you figure out how to better deal with them. *You deserve to feel good.*

The following signs suggest that you should seek some extra guidance:

- Your grades are dropping.
- You worry a lot.
- You easily get moody or angry.
- You feel tired all the time.
- You get a lot of headaches, dizziness, chest pain, or stomach pain.
- You feel sad or hopeless.
- You feel bored all the time and are less interested in being with friends.
- You are thinking about using alcohol or drugs to try to feel better.
- You ever think about hurting yourself.
- You are using unhealthy coping strategies and are having trouble replacing them with healthier ones.

Remember that one of the best ways to be happy and successful is to manage stress well. You can do it!

Adapted from Ginsburg KR, Jablow MM. Building Resilience in Children and Teens: Giving Kids Roots and Wings. *2nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2011*

STRESS WORKSHEET

1. Eustress vs. Distress

There are two types of Stress.

- Eustress: positive, good stress that comes from situations that are enjoyable. (e.g., wining a game)
- Distress: Negative, bad stress that can be harmful to the body. (e.g., doing poorly on a test)

Review your Stress Diary. From your stress list, identify examples of eustress and distress in the space below.

Eustress _____

Distress _____

2. From your Stress Diary list, identify stressors and their physical and mental symptoms.

Stressors	Symptoms	
	Physical	Mental

3. Review your Stress Diary and identify the areas of distress of most concern.

_____

_____

_____

4. **Many stressors can be changed, eliminated, or minimized. Here are some examples of things you can do to reduce your level of stress:**

Exercise	➢ Exercise regularly. ➢ Practice relaxation techniques. For example, whenever you feel tense, slowly breathe in and out for several minutes.
Nutrition	➢ Eat a balanced diet daily. Eat more whole grains, nuts, fruits and vegetables. Substitute fruits for desserts. ➢ Choose foods that are low in fat, sugar, and salt.
Sleep	➢ In a typical week, get sufficient sleep to wake up refreshed. ➢ Do not use medication or chemical substances (including alcohol) to help you sleep.
Stimulants	➢ Avoid caffeine, nicotine, sugar, and cola. ➢ Do not use medication or chemical substances (including alcohol) to reduce your anxiety or to calm you down.
Support System	➢ Have one or more friends with whom you can share personal matters. ➢ Talk with friends or someone you can trust about your worries/problems.
Nurture-Self	➢ Keep reinforcing positive self-statements in your mind. ➢ Focus on your good qualities and accomplishments ➢ Do something you really enjoy which is "just for me" during the course of an average week. ➢ Recognize and accept your limits. Remember that everyone is unique and different.
Good time management skills	➢ Plan ahead and avoid procrastination. ➢ Make a weekly schedule and try to follow it. ➢ Set realistic goals. ➢ Set priorities. ➢ See the iStudy for Success module on Time Management (http://iStudy.psu.edu/modules.html)
Relax	➢ Take a warm bath or shower. ➢ Go for a walk. ➢ Get a hobby or two. Relax and have fun. ➢ Get in touch! Hug someone, hold hands, or stroke a pet. Physical contact is a great way to relieve stress.

Think about how to cope with and prevent the distress you identified in your Stress Diary and the questions above. Describe your plan for coping with distress in the space below.

Exercise	
Nutrition	
Sleep	
Stimulants	
Support System	
Nurture-Self	
Good time management skill	
Relax	
Other	

Health WEEK 2

TeensHealth from Nemours

KidsHealth / For Teens / Headaches

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MORE ON THIS TOPIC FOR: Teens

Concussions: What to Do
Stress
Brain and Nervous System
Migraine Headaches

Reviewed by: Elana Pearl Ben-Joseph, MD

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en español
Dolores de cabeza

What Are Headaches?

Although it may feel like it, a headache is not actually a pain in your brain. The brain tells you when other parts of your body hurt, but it can't feel pain itself.

Most headaches happen in the nerves, blood vessels, and muscles that cover a person's head and neck. Sometimes the muscles or blood vessels swell, tighten, or go through other changes that stimulate the surrounding nerves or put pressure on them. These nerves send a rush of pain messages to the brain, and this brings on a headache.

What Are the Kinds of Headaches?

The most common type of headache is a **tension headache** (also called a muscle-contraction headache). This happens when stressed-out head or neck muscles keep squeezing too hard. With this kind of headache, the pain is usually dull and constant. It might feel as though something is pressing or squeezing on the front, back, or both sides of your head.

Pain that's especially sharp and throbbing can be a sign of a migraine headache. Migraine headaches aren't as common as tension headaches. But for teens who do get them, the pain can be strong enough to make them miss school or other activities if the headaches aren't treated.

One big difference between tension headaches and migraines is that migraines sometimes cause people to feel sick or even to throw up. Tension headaches typically don't cause nausea or vomiting, and

What Causes Headaches?

Click here to read more about migraines

Lots of different things can bring on headaches. Most headaches are related to:

- stress
- dehydration
- computer or TV watching
- loud music
- smoking
- alcohol
- caffeine (people who drink a lot of caffeinated drinks might get caffeine-withdrawal headaches)
- skipping meals
- lack of sleep
- a bump to the head
- taking a long trip in a car or bus
- allergies

These infections can also bring on headaches in some people:

- cold or flu
- sinus infections
- strep throat
- urinary tract infections
- ear infections
- Lyme disease

For some teens, hormonal changes can also cause headaches. For example, some girls get headaches just before their periods or at other regular times during their monthly cycle.

Who Gets Headaches?

Headaches are common in people of all ages.

Migraine headaches often are hereditary. So if a parent, grandparent, or other family member gets them, there's a chance you could get them too. Some people are sensitive to things that can bring on migraine headaches (called triggers), such as some foods, stress, changes in sleep patterns, or even the weather.

When Should I Call the Doctor?

If you think your headaches may be migraines, you'll want to see a doctor to treat them and learn ways to try to avoid getting the

well as a headache:

- changes in vision, such as blurriness or seeing spots
- tingling sensations (for example, in the arms or legs)
- skin rash
- weakness, dizziness, or difficulty walking or standing
- neck pain or stiffness
- fever

If you do see a doctor for headaches, he or she will probably want to do a physical exam and get your medical history to help figure out what might be causing the headaches.

The doctor may ask you:

- how severe and frequent your headaches are
- when they happen (to see if the headaches have a pattern or are connected to any specific foods or events)
- about any medicine you take
- about any allergies you have
- if you're feeling stressed
- about your diet, habits, sleeping patterns, and what seems to help or worsen the headaches

The doctor may also do blood tests or imaging tests, such as a CAT scan or MRI of the brain, to rule out medical problems.

Sometimes doctors will refer people with headaches they think might be migraines or a symptom of a more serious problem to a specialist like a neurologist , a doctor who specializes in the brain and nervous system.

It's very rare that headaches are a sign of something serious. But see a doctor if you have headaches more than three times a month or have a headache that:

- is particularly painful and different from the kinds of headaches you've had before
- doesn't go away easily
- follows an injury, such as hitting your head
- causes you to miss school

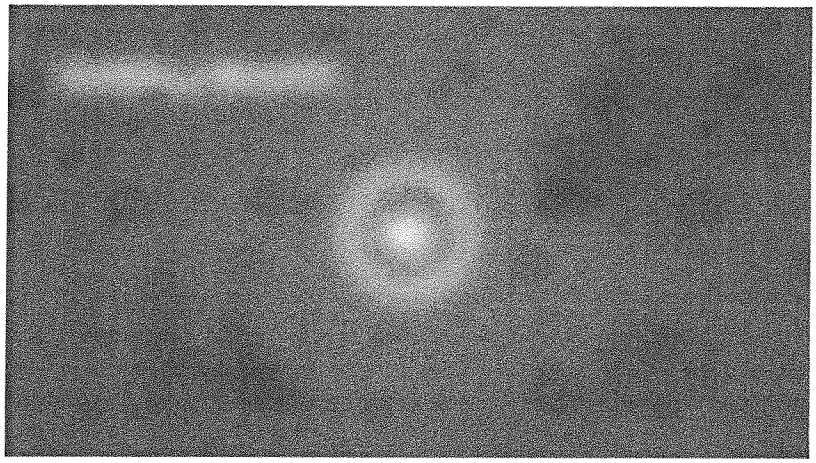
How Can I Feel Better?

Most headaches will go away if a person rests or sleeps. When you get a headache, lie down in a cool, dark, quiet room and close your

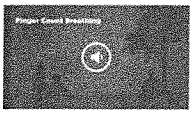
You can buy these in drugstores under various brand names — and your drugstore may carry its own generic brand. It's a good idea to avoid taking aspirin for a headache because it may cause a rare but dangerous disease called Reye syndrome.

If you are taking over-the-counter pain medicines more than twice a week for headaches, or if you find these medicines are not working for you, talk to your doctor.

Most headaches are not a sign that something more is wrong. But if your headaches are intense and happen often, there are lots of things a doctor can do, from recommending changes in your diet to prescribing medicine. You don't have to put up with the pain!



Smiling Breath
This breathing exercise can help you lift stress or switch from a difficult mood to a more positive one.



Finger Count Breathing
Finger count breathing is a good way to slow down and hit your internal "pause" button.

Belly Breathing
When we're relaxed, air naturally flows deeper into our lungs. Practicing belly breathing can help you create these feelings of relaxation a...

Reviewed by: Elana Pearl Ben-Joseph, MD
Date reviewed: September 2018

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WHAT CAUSES THE DISEASE:

WHAT ARE THE SYMPTOMS OF THE DISEASE:

Name of the disease

WHAT TREATMENTS ARE AVAILABLE:

ADDITIONAL INFORMATION: