FIRSTLINE SCHOOLS
EDUCATION FOR LIFE

DISTANCE LEARNING FOR FIRSTLINE STUDENTS

PACKET #2

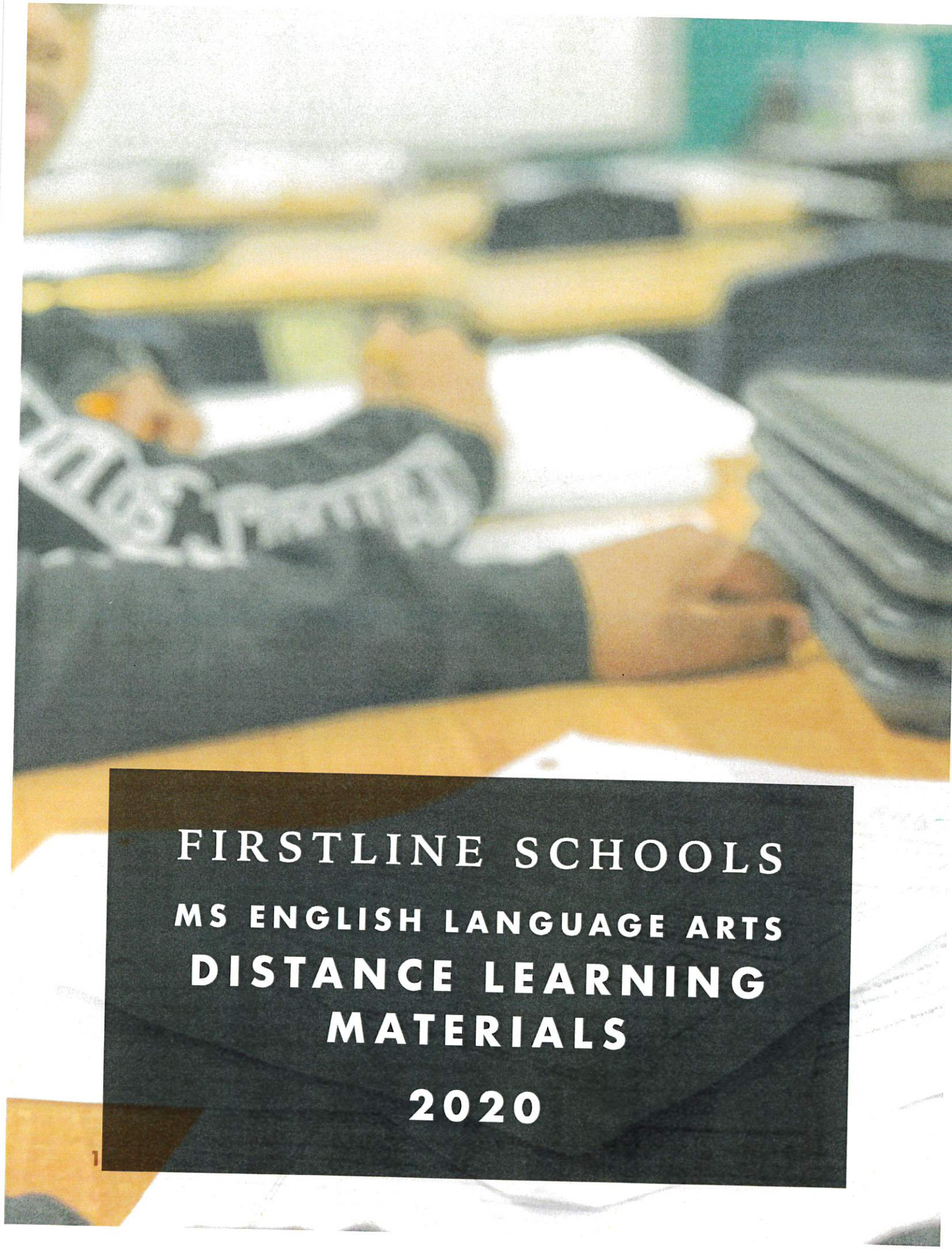
Start Date: Monday, March 30, 2020

GRADE:

K 1 2 3 4 5 6 (7) 8

CONTENT INCLUDED:

(ELA) (MATH) (SCIENCE) SOCIAL STUDIES



FIRSTLINE SCHOOLS

MS ENGLISH LANGUAGE ARTS

DISTANCE LEARNING MATERIALS

2020

Read for Deeper Meaning:

When reading fiction...

- Write a **gist** for each section or stanza
- Describe the **setting**: Where and when does the story take place? How does the setting influence the characters?
- Name the **conflict or problem:** who wants what? And what is getting in their way?
- Describe the **point of view:**
  - 1st - "I" "We" "Our"
  - 2nd- "You" "Your"
  - 3rd- "He" "She" "They"
  - Is it an all-knowing "omniscient" point of view or a limited point of view?
- Define the **perspective:** How is the narrator/ character connected to the events? How do they feel about them?
- Identify how the **characters change** over the course of the story: How did the events of the story affect the characters?
- Identify the **theme**

LITERARY ANALYSIS TASK:

Students read two fiction texts on a similar topic (which could be a story or poem) and compare the texts approach-which could include structure, point of view, setting or other literary elements.

Criteria for Success

1. *Answers the prompt with a clear claim*
2. *Gives reasons to support the claim*
3. *Includes evidence from all texts referenced in the prompt*
4. *Explains or interprets evidences' connection to reasons and claim*

GEORGES AND THE JEWELS

Today you will analyze a passage from *The Georges and the Jewels* and a passage from *Black Beauty: The Autobiography of a Horse*. As you read these passages, you will gather information and answer questions about how the authors develop each narrator's point of view so you can write an essay.

Read the passage from the novel *The Georges and the Jewels*. Then answer the questions.

from *The Georges and the Jewels*

by Jane Smiley

1 Sometimes when you fall off your horse, you just don't want to get right back on. Let's say he started bucking and you did all the things you knew to do, like pull his head up from between his knees and make him go forward, then use a pulley rein on the left to stop him. Most horses would settle at that point and come down to a walk. Then you could turn him again and trot off—it's always harder for the horse to buck at the trot than at the lope. But if, right when you let up on the reins, your horse put his head between his knees again and took off bucking, kicking higher and higher until he finally dropped you and went tearing off to the other end of the ring, well, you might lie there, as I did, with the wind knocked out of you and think about how nice it would be not to get back on, because that horse is just dedicated to bucking you off.

2 So I did lie there, looking up at the branches of the oak tree that grew beside the ring, and I did wait for Daddy to come trotting over with that horse by the bridle, and I did stare up at both their faces, the face of that horse flicking his ears back and forth and snorting a little bit, and the face of my father, red-cheeked and blue-eyed, and I did listen to him say, "Abby? You okay, honey? Sure you are. I saw you bounce! Get up, now."

3 I sighed.

4 "How am I going to tell those folks who are looking to buy these horses that a little girl can ride them, if you don't get up and ride them?"

5 I sat up. I said, "I don't know, Daddy." My elbow hurt, but not too badly. Otherwise I was okay.

6 "Well, then."

7 I stood up, and he brushed off the back of my jeans. Then he tossed me on the horse again.

8 Some horses buck you off. Some horses spook you off—they see something scary and drop a shoulder and spin and run away. Some horses stop all of a sudden, and there you are, head over heels and sitting on the ground. I had a horse rear so high once that I just slid down over her tail and landed in the grass easy as you please, watching her run back to the barn. I started riding when I was three. I started training horses for my dad when I was eight. I wasn't the only one—my brother, Danny, was thirteen at the time, and he did most of the riding (Kid's Horse for Sale), but I'm the only one now.

GO ON ▶

9 Which is not to say that there aren't good horses and fun horses. I ride plenty of those, too. But they don't last, because Daddy turns those over fast. I had one a year ago, a sweet bay mare. We got her because her owner had died and Daddy picked her up for a song from the bank. I rode her every day, and she never put a foot wrong. Her lope was as easy as flying. One of the days she was with us, I had a twenty-four-hour virus, so when I went out to ride, I tacked her up and took her down to the crick at the bottom of the pasture, out of sight of the house.

10 I knew Daddy had to go into town and would be gone for the afternoon, so when I got down there, I just took off the saddle and hung it over a tree limb, and the bridle, too, and I lay down in the grass and fell asleep. I knew she would graze, and she did for a while, I suppose. But when I woke up (and feeling much better, thank you), there she was, curled up next to me like a dog, kind of pressed against me but sweet and large and soft. I lay there feeling how warm she was and smelling her fragrance and I thought, I never heard of this before. I don't know why she did that, but now when Daddy tells me that horses only know two things, the carrot and the stick, and not to fill my head with silly ideas about them, I just remember that mare (she had a star shaped like a triangle and a little snip down by her left nostril). We sold her for a nice piece of change within a month, and I wish I knew where she was.

GO ON ▶

1. **Part A**

What is the meaning of **tearing** as it is used in paragraph 1 of the passage from *The Georges and the Jewels*?

Ⓐ ripping
Ⓑ pulling
Ⓒ speeding
Ⓓ crying

2. **Part B**

Which phrase in paragraph 1 helps the reader understand the meaning of **tearing**?

Ⓐ ". . . let up on the reins . . ."
Ⓑ ". . . put his head between his knees . . ."
Ⓒ ". . . off to the other end of the ring . . ."
Ⓓ ". . . kicking higher and higher . . ."

GO ON ▶

3. **Part A**

In the passage from *The Georges and the Jewels*, how do the father's actions affect the narrator's life?

Ⓐ The father's kindness causes him to carry the narrator into the house after she falls off the horse.

Ⓑ The father's love of horses causes him to show the narrator how beautiful the animals are when they walk.

Ⓒ The father's desire to sell horses causes him to quickly place the narrator back on the horse after she falls.

Ⓓ The father's expectation of obedience causes him to require the narrator to keep trying.

4. **Part B**

Choose evidence from the passage from *The Georges and the Jewels* that best supports the answer to Part A.

Ⓐ ". . . and I did wait for Daddy to come trotting over with that horse . . . ." (paragraph 2)

Ⓑ ". . . and the face of my father, red-cheeked and blue-eyed . . ." (paragraph 2)

Ⓒ " 'Abby? You okay, honey?' " (paragraph 2)

Ⓓ ". . . he tossed me on the horse again." (paragraph 7)

GO ON ▶

5. **Part A**

In the passage from *The Georges and the Jewels*, how are the father's and narrator's points of view toward horses different?

Ⓐ The father thinks horses are easy to tame, while the narrator believes horses are dangerous animals.

Ⓑ The father believes horses only respond to punishment and reward, while the narrator thinks horses have feelings.

Ⓒ The father thinks only boys should ride horses, while the narrator thinks girls should be able to ride them, too.

Ⓓ The father wants his daughter to ride horses more, but the narrator worries about getting hurt.

6. **Part B**

Which **two** pieces of evidence **best** support the answer to Part A?

Ⓐ "Sometimes when you fall off your horse, you just don't want to get right back on." (paragraph 1)

Ⓑ ". . . my brother, Danny, was thirteen at the time, and he did most of the riding. . . ." (paragraph 8)

Ⓒ "Which is not to say that there aren't good horses and fun horses." (paragraph 9)

Ⓓ "Her lope was as easy as flying." (paragraph 9)

Ⓔ ". . . there she was, curled up next to me like a dog, kind of pressed against me but sweet and large and soft." (paragraph 10)

Ⓕ ". . . Daddy tells me that horses only know two things, the carrot and the stick, and not to fill my head with silly ideas about them. . . ." (paragraph 10)

GO ON ▶

BLACK BEAUTY: THE AUTOBIOGRAPHY OF A HORSE

Read the passage from the novel *Black Beauty: The Autobiography of a Horse*. Then answer the questions.

from *Black Beauty: The Autobiography of a Horse*

by Anna Sewell

1 Every one may not know what breaking in is, therefore I will describe it. It means to teach a horse to wear a saddle and bridle, and to carry on his back a man, woman or child; to go just the way they wish, and to go quietly. Besides this he has to learn to wear a collar, a crupper, and a breeching, and to stand still while they are put on; then to have a cart or chaise fixed behind, so that he cannot walk or trot without dragging it after him; and he must go fast or slow, just as his driver wishes. He must never start at what he sees, nor speak to other horses, nor bite, nor kick, nor have any will of his own; but always do his master's will, even though he may be very tired or hungry; but the worst of all is, when his harness is once on, he may neither jump for joy nor lie down for weariness. So you see this breaking in is a great thing.

2 I had of course been used to a halter and a headstall, and to be led about in the fields and lanes quietly, but now I was to have a bit and bridle; my master gave me some oats as usual, and after a good deal of coaxing he got the bit into my mouth, and the bridle fixed, but it was a nasty thing! Those who have never had a bit in their mouths cannot think how bad it feels; a great piece of cold hard steel as thick as a man's finger to be pushed into one's mouth, between one's teeth, and over one's tongue, with the ends coming out at the corner of your mouth, and held fast there by straps over your head, under your throat, round your nose, and under your chin; so that no way in the world can you get rid of the nasty hard thing; it is very bad! Yes, very bad! At least I thought so; but I knew my mother always wore one when she went out, and all horses did when they were grown up; and so, what with the nice oats, and what with my master's pats, kind words, and gentle ways, I got to wear my bit and bridle.

3 Next came the saddle, but that was not half so bad; my master put it on my back very gently, while old Daniel held my head; he then made the girths fast under my body, patting and talking to me all the time; then I had a few oats, then a little leading about; and this he did every day till I began to look for the oats and the saddle. At length, one morning, my master got on my back and rode me round the meadow on the soft grass. It certainly did feel queer; but I must say I felt rather proud to carry my master, and as he continued to ride me a little every day, I soon became accustomed to it.

Black Beauty: The Autobiography of a Horse—Public Domain

GO ON ▶

1. **Part A**

As used in paragraph 2 of the passage from *Black Beauty: The Autobiography of a Horse*, what is the meaning of the word **fast**?

Ⓐ cheerfully

Ⓑ securely

Ⓒ carefully

Ⓓ quickly

2. **Part B**

As used in paragraph 2, which phrase supports the meaning of the word **fast**?

Ⓐ ". . . cannot think how bad it feels . . ."

Ⓑ ". . . no way in the world can you get rid of the nasty hard thing . . ."

Ⓒ ". . . I knew my mother always wore one when she went out . . ."

Ⓓ ". . . and what with my master's pats, kind words, and gentle ways . . ."

3. **Part A**

How does the horse feel about wearing riding gear in the passage from *Black Beauty: The Autobiography of a Horse*?

Ⓐ The horse dislikes wearing the gear and will never get used to wearing it.
Ⓑ The horse is displeased with wearing the gear but learns to accept it.
Ⓒ The horse believes the saddle is the worst part of wearing the gear.
Ⓓ The horse wishes to be like his mother and enjoy wearing the gear.

4. **Part B**

Which **two** statements support the correct answer to Part A?

Ⓐ Being broken in means to carry a man, woman, or child on his back.
Ⓑ A bit is placed in the horse's mouth and is held by a strap over the head.
Ⓒ The horse's mother always wore a bit when she went out.
Ⓓ The horse complains about how uncomfortable the bit feels in his mouth.
Ⓔ The master rides the horse around a meadow.
Ⓕ The horse enjoys the attention he receives from wearing his saddle.

GO ON ▶

You have read passages from the novels *The Georges and the Jewels* and *Black Beauty: The Autobiography of a Horse*. Both were written in the first person point of view.

Write an essay in which you compare the way the authors use first person point of view to develop the characters.

Be sure to cite specific examples from **both** passages.

GO ON ▶

GO ON ▶

GO ON ▶


STOP

RESEARCH TASK:

Students read 2-3 non fiction texts and write an informative essay in which they use evidence from all of the texts provided.

Criteria for Success

1. *Answers the prompt with a clear claim*
2. *Gives reasons to support the claim*
3. *Includes evidence from all texts referenced in the prompt*
4. *Explains or interprets evidences' connection to reasons and claim*

Read for Deeper Meaning:

When reading non fiction...

- Write a gist for each section of the passages
- Describe the point of view: Who is the author? How are they connected to the topic? How does this influence what they include?
- Name the structure: cause & effect? chronological? description? compare/contrast? problem/solution?
- Identify the different types of evidence used: Quotations from experts, statistics, personal anecdotes (stories), facts
- Write a central idea

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Students read 2-3 non fiction texts and write an informative essay in which they use evidence from all of the texts provided.

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KLONDIKE GOLD RUSH

Today you will research the gold rush in the late 1800s. You will read the article "Klondike Gold Rush." Then you will read a passage from *A Woman Who Went to Alaska* and read a transcript from the video *City of Gold*. As you review these sources, you will gather information and answer questions about the authors' points of view and the way they present information so you can write an essay.

Read the article "Klondike Gold Rush." Then answer the questions.

Klondike Gold Rush

Yukon Territory, 1897

1 The Klondike gold rush began in July of 1897 when two ships docked in San Francisco and Seattle carrying miners returning from the Yukon with bags of gold. The press was alerted, and papers carried the story to the masses.

2 Soon, miners of all shapes and sizes, called "stampeders," were on their way to the gold fields. Within six months, approximately 100,000 gold-seekers set off for the Yukon. Only 30,000 completed the trip.

3 Most stampeders knew little or nothing about where they were going, so pamphlets were available to help them on their way. Many of the pamphlets contained little or no real information and made outrageous claims of wealth to be had by everyone. Outfitters sprang up overnight that were happy to sell the stampeders whatever they needed to get started. This included food; clothing; tools; and camping, mining, and transportation equipment. Helping the outfitters in this regard were the Northwest Mounted Police who required all stampeders to have one year's supply of goods before they allowed them across the border into Canada. This was roughly one ton of goods per person. Towns such as Seattle made fortunes outfitting the miners.

4 The easiest and most expensive route to the gold fields was by boat upstream from the mouth of the Yukon in western Alaska. The most difficult route was the "All Canadian Route" from Edmonton and overland through the wilderness.

5 The most common route taken by the stampeders to reach the fields was by boat from the west coast of the continental U.S. to Skagway in Alaska, over the Chilkoot Pass or White Pass to the Yukon River at Whitehorse and then by boat 500 miles to Dawson City.

6 The Chilkoot Pass trail was steep and hazardous. Rising 1,000 feet in the last 1/2 mile, it was known as the "golden staircase": 1,500 steps carved out of snow and ice worked their way to the top of the pass. Too steep for packhorses, stampeders had to "cache" their goods, moving their equipment piecemeal up the mountain. Stampeders who gave up often did it here, discarding their unneeded equipment on the side of the trail.

7 Conditions on the White Pass trail were even more horrendous. Steep, narrow, and slick, over 3,000 pack animals died on the trail, causing it to be dubbed the "dead horse trail."

GO ON ▶

8 Those who made it across the passes found themselves at Bennett Lake. Here, boats had to be built to run the final 500 miles down the Yukon River to the gold fields. A three-week trip, the miners had to survive many sets of rapids before making it to Dawson City. Many miners lost their lives or their possessions when their boats broke up in the rapids.

9 Those who survived the perilous journey mostly found disappointment once they reached Dawson City. Locals had already claimed all of the gold-bearing creeks, and claims of "gold for the taking" were grossly exaggerated. Many stampeders headed home, some worked for others on the claims, and still others stayed to work in Dawson City.

10 The work that was necessary to retrieve the gold was incredible. Most of the gold was not at the surface, but rather 10 or more feet below. To reach it, the miners had to dig through the permafrost—the layer of permanently frozen ground. The ground had to be thawed before it could be dug. Then the dirt had to be sluiced to separate it from the gold. All digging had to be done during the summer as it was impossible to dig in the winter when temperatures could reach –60°F. It was incredibly difficult work.

11 The biggest boom to hit this part of the world was a huge bust for the miners. The only ones to strike it rich were the merchants and profiteers who took advantage of those who hoped to "get rich quick."

"Klondike Gold Rush"—Public Domain

GO ON ▶

1. **Part A**

What is the meaning of **pamphlets** as it is used in paragraph 3 of "Klondike Gold Rush"?

Ⓐ tokens for miners

Ⓑ stocked wagons

Ⓒ guides for miners

Ⓓ camping kits

2. **Part B**

Which detail from paragraph 3 helps the reader understand the meaning of **pamphlets**?

Ⓐ "Most stampeders knew little or nothing about where they were going. . . ."

Ⓑ "This included food; clothing; tools; and camping, mining, and transportation equipment."

Ⓒ "Helping the outfitters in this regard were the Northwest Mounted Police. . . ."

Ⓓ "This was roughly one ton of goods per person."

3. **Part A**

How does the author **mainly** organize paragraphs 1 and 2 in the article "Klondike Gold Rush"?

Ⓐ chronological order

Ⓑ cause and effect

Ⓒ problem and solution

Ⓓ compare and contrast

4. **Part B**

Which description **best** illustrates how the structure in Part A is achieved?

Ⓐ "The Klondike gold rush began in July of 1897. . . ." (paragraph 1)

Ⓑ "The press was alerted. . . ." (paragraph 1)

Ⓒ ". . . miners of all shapes and sizes . . ." (paragraph 2)

Ⓓ "Only 30,000 completed the trip." (paragraph 2)

GO ON ▶

5. **Part A**

Based on the information from "Klondike Gold Rush," which sentence states a central idea of the article?

Ⓐ Most miners were pleased with the outcome of the gold rush.

Ⓑ Most miners labored hard for very little gain.

Ⓒ Work in the Yukon Territory was worth the danger of traveling there.

Ⓓ The gold rush hurt many small businesses.

6. **Part B**

Which **two** sentences from the article provide the best evidence for the answer in Part A?

Ⓐ "Outfitters sprang up overnight that were happy to sell the stampeders whatever they needed to get started." (paragraph 3)

Ⓑ "Towns such as Seattle made fortunes outfitting the miners." (paragraph 3)

Ⓒ "Those who made it across the passes found themselves at Bennett Lake." (paragraph 8)

Ⓓ "Many stampeders headed home, some worked for others on the claims, and still others stayed to work in Dawson City." (paragraph 9)

Ⓔ "The work that was necessary to retrieve the gold was incredible." (paragraph 10)

Ⓕ "The biggest boom to hit this part of the world was a huge bust for the miners." (paragraph 11)

GO ON ▶

7. **Part A**

Based on evidence in the article, why did so few miners stay in the Klondike to mine gold after arriving?

Ⓐ The conditions for mining were difficult.

Ⓑ Many laws outlawed miners.

Ⓒ The lack of wildlife made mining nearly impossible.

Ⓓ The value of gold dropped significantly.

8. **Part B**

Which detail from the article supports the answer to Part A?

Ⓐ "Helping the outfitters in this regard were the Northwest Mounted Police. . . ." (paragraph 3)

Ⓑ "The Chilkoot Pass trail was steep and hazardous." (paragraph 6)

Ⓒ "Here, boats had to be built. . . ." (paragraph 8)

Ⓓ "Most of the gold was not at the surface. . . ." (paragraph 10)

GO ON ▶

A WOMAN WHO WENT TO ALASKA

Read the passage from the book *A Woman Who Went to Alaska*. Then answer the questions.

from *A Woman Who Went to Alaska*

by May Kellogg Sullivan

The Rush

1 Since the discovery of gold by George Carmack on Bonanza Creek in September 1896, the growth of this country has been phenomenal, more especially so to one who has visited and is familiar with Dawson and the Klondyke mining section.

2 As to the entire yield of gold from the Klondyke Creeks, none can say except approximately; for the ten percent royalty imposed by the Canadian government has always met a phase of human nature which prompts to concealment and dishonesty, so that a truthful estimate cannot be made.

3 The Canadian Dominion government is very oppressive. Mining laws are very arbitrary and strictly enforced. A person wishing to prospect for gold must first procure a miner's license, paying ten dollars for it. If anything is discovered, and he wishes to locate a claim, he visits the recorder's office, states his business, and is told to call again. In the meantime, men are sent to examine the locality and if anything of value is found, the man wishing to record the claim is told that it is already located. The officials seize it. The man has no way of ascertaining if the land was properly located, and so has no redress. If the claim is thought to be poor, he can locate it by the payment of a fifteen dollar fee.

4 One half of all mining land is reserved for the crown, a quarter or more is gobbled by corrupt officials, and a meager share left for the daring miners who, by braving hardship and death, develop the mines and open up the country.

5 "Any one going into the country has no right to cut wood for any purpose, or to kill any game or catch any fish, without a license for which a fee of ten dollars must be paid. With such a license it is unlawful to sell a stick of wood for any purpose, or a pound of fish or game." The law is strictly enforced. To do anything, one must have a special permit, and for every such permit he must pay roundly.

6 The story is told of a miner in a hospital who was about to die. He requested that the Governor be sent for. Being asked what he wanted with the Governor, he replied: "I haven't any permit, and if I should undertake to die without a permit, I should get myself arrested."

GO ON ▶

7 It is a well-known fact that many claims on Eldorado, Hunker, and Bonanza Creeks have turned out hundreds of thousands of dollars. One pan of gravel on Eldorado Creek yielded $2,100. Frank Dinsmore on Bonanza Creek took out ninety pounds of solid gold or $24,480 in a single day. On Aleck McDonald's claim on Eldorado, one man shoveled in $20,000 in twelve hours. McDonald, in two years, dug from the frozen ground $2,207,893. Charley Anderson, on Eldorado, panned out $700 in three hours. T.S. Lippy is said to have paid the Canadian government $65,000 in royalties for the year 1898 and Clarence Berry about the same.

8 On Skukum Gulch $30,000 were taken from two boxes of dirt. Frank Phiscator of Michigan, after a few months' work, brought home $100,000 in gold, selling one-third of his claim interests for $1,333,000, or at the rate of $5,000,000 for the whole.

9 When a man is compelled to pay one thousand dollars out of every ten thousand he digs from the ground, he will boast little of large "clean-ups"; and for this reason it is hard to estimate the real amount of gold extracted from the Klondyke mines.

"A Woman Who Went to Alaska"—Public Domain

GO ON ▶

1. **Part A**

As used in paragraph 3 of the passage from *A Woman Who Went to Alaska*, what is the meaning of the word **oppressive**?

Ⓐ unjustly harsh

Ⓑ occasionally flexible

Ⓒ unexpectedly angry

Ⓓ appropriately demanding

2. **Part B**

Which phrase from paragraph 3 in the passage from *A Woman Who Went to Alaska* helps the reader understand the meaning of the word **oppressive**?

Ⓐ ". . . Canadian Dominion government . . ."

Ⓑ ". . . arbitrary and strictly enforced . . ."

Ⓒ ". . . prospect for gold . . ."

Ⓓ ". . . he visits the recorder's office . . ."

GO ON ▶

3. **Part A**

Which statement **best** describes the Canadian government's treatment of the miners in the passage from *A Woman Who Went to Alaska*?

Ⓐ a controlling government that takes advantage of the miners

Ⓑ a fair government that wants the miners to succeed without assistance

Ⓒ a disorganized government that fails to set appropriate rules for the miners

Ⓓ an irresponsible government that is indifferent to the miners

4. **Part B**

Which **three** actions does the government take that provide evidence for the answer to Part A?

Ⓐ charging high taxes on mined gold

Ⓑ encouraging fishing and hunting

Ⓒ enforcing a nightly curfew

Ⓓ requiring multiple licenses and permits

Ⓔ seizing property known to contain gold

Ⓕ assisting newcomers seeking a claim

Ⓖ banning the use of explosives

GO ON ▶

CITY OF GOLD

Read a transcript of an excerpt from *City of Gold*. Then answer the questions.

from *City of Gold*

a transcript

1 The winter of 1897, beyond mountains two thousand miles north from civilization, the cry was "Gold!" All over the world a million people laid plans to go. A hundred thousand actually set out, but the going was so hard, the way so weary, that more than half turned back.

2 My father was one of those who struggled on. Scarcely any of these men were miners; most were white-collar workers. My father had just graduated from university in civil engineering. All of them had one idea. They were on their way to the Klondike to shovel up gold, and they were going to be rich beyond the dreams of avarice.

3 The Chilkoot Pass: this scene above all others remained in my father's mind to his dying day. Even when his memory began to fail, this spectacle remained. You had to pack a ton of goods up this terrible 45-degree slope of pure ice, a hundred pounds at a time, over and over again, a year's outfit. Without that, the mounties would not let you enter the Yukon. You couldn't stop to rest or it might be hours before they'd let you back into that endless human chain.

4 At the top, a city of provisions. Seventy feet of snow fell that winter, and by spring there were seven such cities, layer upon layer buried beneath it, but the persistent ones dug out their supplies and sledded off down the mountain slopes on the next lap of the great adventure.

GO ON ▶

1 **Part A**

What are the **most likely** reasons the narrator mentions that his father was a part of the gold rush? Select **two** answers.

Ⓐ It explains that the narrator respects his family.

Ⓑ It shows the extent to which the narrator values history.

Ⓒ It helps the reader understand the narrator's life.

Ⓓ It reveals a connection between the narrator and the miners.

Ⓔ It highlights the impact of the experience on a specific person.

Ⓕ It emphasizes that there were a large number of miners with families.

2. **Part B**

Which words from the transcript of *City of Gold* provide the **best** evidence for the answers to Part A?

Ⓐ "beyond mountains . . . the cry was 'Gold!' " (paragraph 1)

Ⓑ "Scarcely any of these men were miners; most were white-collar workers." (paragraph 2)

Ⓒ "All of them had one idea. . . . they were going to be rich . . ." (paragraph 2)

Ⓓ "The Chilkoot Pass: this scene above all others remained in my father's mind. . . ." (paragraph 3)

GO ON ▶

The authors of "Klondike Gold Rush" and *A Woman Who Went to Alaska* and the narrator of the transcript from *City of Gold* are discussing the same topic but are using different points of view.

How does each person's point of view shape the reader's understanding of the miners' lives? Use details from each source to support your answer.

GO ON ▶

GO ON ▶

GO ON ▶


STOP

7th Grade Math			
Date	**Lesson**	**Learning Goals**	**Assignment**
Monday, March 30	Unit 8, Lesson 14 Sampling in a Fair Way	• I can describe ways to get a random sample from a population. • I know that selecting a sample at random is usually a good way to get a representative sample	Complete **Daily Warm-Up** Complete **Illustrative Mathematics Lesson** for the Day For each lesson: 1. Review Lesson Summary 2. Complete Lesson Activities 3. Complete Practice Problems
Tuesday, March 31	Unit 8, Lesson 15 Estimating Population Measures of Center	• I can consider the variability of a sample to get an idea for how accurate my estimate is. • I can estimate the mean or median of a population based on a sample of the population.	
Wednesday, April 1	Unit 8, Lesson 16 Estimating Population Proportions	• I can estimate the proportion of population data that are in a certain category based on a sample.	
Thursday, April 2	Unit 8, Lesson 17 Comparing Populations Using Samples	• I can use the means from many samples to judge how accurate an estimate for the population mean is. • I know that as the sample size gets bigger, the sample mean is more likely to be close to the population mean.	
Friday, April 3	Unit 8, Lesson 18	• I can calculate the difference between two medians as a multiple of the interquartile range. • I can determine whether there is a meaningful difference between two populations based on a sample from each population.	
Monday, April 6	Unit 8, Lesson 19	• I can decide what information I need to know to be able to compare two populations based on a sample from each.	
Tuesday, April 7	Unit 8, Lesson 20	• I can compare two groups by taking a random sample, calculating important measures, and determining whether the populations are meaningfully different.	
Wednesday, April 8	Unit 8 Review/Practice	Complete practice assessment	
Spring Break: April 9- April 13			

7th Grade Warm Ups

Monday, March 30

The cost of granola bars is proportional to the number of granola bars as shown in the table.

Number of Granola Bars	Cost
4	$9.00
12	$27.00
24	$54.00

What is the constant of proportionality, in dollars per granola bar?

Enter your answer in the box.

$ ☐

Last year, Andrea bought 85 songs from an online company for a total of $96.90. Each song cost $1.09 plus tax.

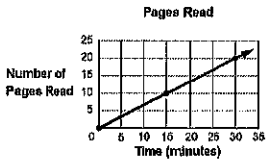
Part A

Which equation can be used to determine the amount of tax, x, in dollars, that Andrea paid for each song?

- $85(1.09) + x = 96.90$
- $85x + 1.09 = 96.90$
- $85(1.09 + x) = 96.90$
- $x(85 + 1.09) = 96.90$

Tuesday, March 31

Raul created a graph to show the number of pages he read over a period of time.



Raul claims his graph shows a proportional relationship because the data forms a straight line. He also claims his graph shows he read 1.5 pages per minute. Are Raul's claims correct? Justify your reasoning. Write an equation to represent the data in the graph.

Enter your justifications and equation in the box.

Calculator

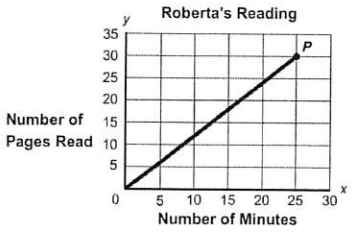
A family buys 6 tickets to a show. They also pay a $3 parking fee. They spend $27 to see the show.

Create an equation to model the situation.

What is the cost of each ticket?

Wednesday, April 1

The graph represents the number of pages Roberta read over a period of time.



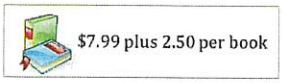
Drag tiles to the empty boxes to correctly complete the sentences about the graph.

Point *P* represents that Roberta read [ ] pages in [ ] minutes.

The unit rate, in pages read per minute, is the [ ]-coordinate in the ordered pair [ ].

x	*y*	25	30	(1, 0.83)	(1, 1.2)	(25, 30)	(30, 25)

Jalen orders books from an online company. The company has a special deal on their books as shown.



The equation $7.99 + 2.50b = 82.99$ represents the number of books, b, Jalen orders. How many books does Jalen order? Show your work or explain how you found your answer.

Thursday, April 2

Simone paid $5.25 for 3 pounds of apples. Which equation represents the cost, in dollars, C, of buying a pounds of apples?

- $C = 1.75a$
- $C = 2.25a$
- $C = 1.75 + a$
- $C = 2.25 + a$

Solve each equation.

a. $2(x - 3) = 14$

b. $-5(x - 1) = 40$

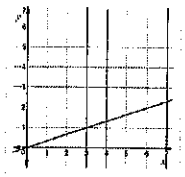
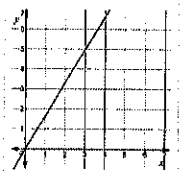
c. $12(x + 10) = 24$

d. $\frac{1}{6}(x + 6) = 11$

e. $\frac{5}{7}(x - 9) = 25$

Friday, April 3

In each row, the equation or graph shows that y is proportional to x. Select one choice in each row of the table to identify the constant of proportionality.

	0	$\frac{1}{5}$	$\frac{3}{5}$	1	$\frac{5}{3}$	3	5
$y = x$	○	○	○	○	○	○	○
$y = \frac{1}{3}x$	○	○	○	○	○	○	○
	○	○	○	○	○	○	○
	○	○	○	○	○	○	○

Match each equation to its solution and to the story it describes.

Equations:

A. $5x - 7 = 3$

B. $7 = 3(5 + x)$

C. $3x + 5 = -7$

D. $\frac{1}{3}(x + 7) = 5$

Solutions:

1. -4
2. $\frac{-8}{3}$
3. 2
4. 8

Monday, April 6

The table shows the number of hours Nina worked on three different days and the amount of money she earned.

Hours Worked	Amount Earned
3	$34.50
5	$57.50
8	$92.00

Part A

Based on the data in the table, write an equation that can be used to determine the amount of money Nina earns given the number of hours she works. Show your work or explain how you determined your equation. Be sure to define your variables.

Solve each equation.

a. $4x = -28$

b. $x - -6 = -2$

c. $-x + 4 = -9$

d. $-3x + 7 = 1$

e. $25x + -11 = -86$

Tuesday, April 7

Consider proportional relationships.

Part A

Which tables show a proportional relationship between x and y? Select all that apply.

x	y
1	1
2	4
3	9

x	y
2	1
4	1
6	1

x	y
1	0.5
2	1
3	1.5

x	y
10	30
15	45
20	60

x	y
0	1
2.5	5
5	10

Part B

On a coordinate plane, a line goes through the point $(3, 1)$ and is the graph of a proportional relationship. Which point does this line also go through?

- $(2, 0)$
- $(4, 12)$
- $(6, 4)$
- $(15, 5)$

Calculator

Solve each equation.

Part A

$\frac{1}{3}p + 7 = 25$

Enter your answer in the box.

$p =$ [ ]

Part B

$-20 = 2(n - 3)$

Enter your answer in the box.

$n =$ [ ]

Wednesday, April 8

What is the constant of proportionality in the table below?

What does it represent in the context of the situation?

Cost of Grain by Weight

Pounds	Cost (in dollars)
1.0	0.25
4.0	1.00

The table shows a proportional relationship between the number of pounds of grapes purchased and the total cost of the grapes.

Grapes

Number of Pounds	Total Cost (dollars)
4	2.76
7	4.83
9	6.21

A row of values is missing in the table.

Which number of pounds of grapes and total cost of the grapes could be used as the missing values in the table?

Select **each** correct response.

(a) Pounds of grapes: 2
Total cost: $1.38

(b) Pounds of grapes: 3
Total cost: $2.53

(c) Pounds of grapes: 6
Total cost: $3.68

(d) Pounds of grapes: 8
Total cost: $5.52

(e) Pounds of grapes: 11
Total cost: $8.97

FirstLine Schools 7th Grade Math Distance Learning Materials: March 30-April 6

Unit 8
Student Task Statements

Probability and Sampling

Click on a title in the list below to scroll directly to that lesson.

NAME DATE PERIOD

Unit 8, Lesson 14

Sampling in a Fair Way

Let's explore ways to get representative samples.

14.1 Ages of Moviegoers

A survey was taken at a movie theater to estimate the average age of moviegoers.

Here is a dot plot showing the ages of the first 20 people surveyed.

1. What questions do you have about the data from survey?

2. What assumptions would you make based on these results?

14.2 Comparing Methods for Selecting Samples

Take turns with your partner reading each option aloud. For each situation, discuss:

- Would the different methods for selecting a sample lead to different conclusions about the population?
- What are the benefits of each method?
- What might each method overlook?

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- Which of the methods listed would be the most likely to produce samples that are representative of the population being studied?
- Can you think of a better way to select a sample for this situation?

1. Lin is running in an election to be president of the seventh grade. She wants to predict her chances of winning. She has the following ideas for surveying a sample of the students who will be voting:

   a. Ask everyone on her basketball team who they are voting for.

   b. Ask every third girl waiting in the lunch line who they are voting for.

   c. Ask the first 15 students to arrive at school one morning who they are voting for.

2. A nutritionist wants to collect data on how much caffeine the average American drinks per day. She has the following ideas for how she could obtain a sample:

   a. Ask the first 20 adults who arrive at a grocery store after 10:00 a.m. about the average amount of caffeine they consume each day.

   b. Every 30 minutes, ask the first adult who comes into a coffee shop about the average amount of caffeine they consume each day.

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5. If you repeated the same process again but you selected a larger sample (such as 10 or 20 straws, instead of just 5), would your estimate be more accurate? Explain your reasoning.

14.4 That's the Last Straw

There were a total of 35 straws in the bag. Suppose we put the straws in order from shortest to longest and then assigned each straw a number from 1 to 35. For each of these methods, decide whether it would be fair way to select a sample of 5 straws. Explain your reasoning.

1. Select the straws numbered 1 through 5.

2. Write the numbers 1 through 35 on pieces of paper that are all the same size. Put the papers into a bag. Without looking, select five papers from the bag. Use the straws with those numbers for your sample.

3. Using the same bag as the previous question, select one paper from the bag. Use the number on that paper to select the first straw for your sample. Then use the next 4 numbers in order to complete your sample. (For example, if you select number 17, then you also use straws 18, 19, 20, and 21 for your sample.)

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4. Create a spinner with 35 sections that are all the same size, and number them 1 through 35. Spin the spinner 5 times and use the straws with those numbers for your sample.

Are you ready for more?

Computers accept inputs, follow instructions, and produce outputs, so they cannot produce truly random numbers. If you knew the input, you could predict the output by following the same instructions the computer is following. When truly random numbers are needed, scientists measure natural phenomena such as radioactive decay or temperature variations. Before such measurements were possible, statisticians used random number tables, like this:

85 67 95 02 42 61 21 35 15 34 41
85 94 61 72 53 24 15 67 85 94 12
67 88 15 32 42 65 75 98 46 25 13
07 53 60 75 82 34 67 44 20 42 33
99 37 40 33 40 88 90 50 75 22 90
00 03 84 57 91 15 70 08 90 03 02
78 07 16 51 13 89 67 64 54 05 26
62 06 61 43 02 60 73 58 38 53 88
02 50 88 44 37 05 13 54 78 97 30

Use this table to select a sample of 5 straws. Pick a starting point at random in the table. If the number is between 01 and 35, include that number straw in your sample. If the number has already been selected, or is not between 01 and 35, ignore it, and move on to the next number.

Lesson 14 Summary

A sample is *selected at random* from a population if it has an equal chance of being selected as every other sample of the same size. For example, if there are 25 students in a class, then we can write each of the students' names on a slip of paper and select 5 papers from a bag to get a sample of 5 students selected at random from the class.

Other methods of selecting a sample from a population are likely to be *biased*. This means that it is less likely that the sample will be representative of the population as a whole. For example, if we select the first 5 students who walk in the door, that will not give us a random sample because students who typically come late are not likely to be selected. A sample that is selected at random may not always be a representative sample, but it is more likely to be representative than using other methods.

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It is not always possible to select a sample at random. For example, if we want to know the average length of wild salmon, it is not possible to identify each one individually, select a few at random from the list, and then capture and measure those exact fish. When a sample cannot be selected at random, it is important to try to reduce bias as much as possible when selecting the sample.

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Unit 8, Lesson 14
Practice Problems

1. The meat department manager at a grocery store is worried some of the packages of ground beef labeled as having one pound of meat may be under-filled. He decides to take a sample of 5 packages from a shipment containing 100 packages of ground beef. The packages were numbered as they were put in the box, so each one has a different number between 1 and 100.

   Describe how the manager can select a fair sample of 5 packages.

2. Select **all** the reasons why random samples are preferred over other methods of getting a sample.

   A. If you select a random sample, you can determine how many people you want in the sample.

   B. A random sample is always the easiest way to select a sample from a population.

   C. A random sample is likely to give you a sample that is representative of the population.

   D. A random sample is a fair way to select a sample, because each person in the population has an equal chance of being selected.

   E. If you use a random sample, the sample mean will always be the same as the population mean.

3. Jada is using a computer's random number generator to produce 6 random whole numbers between 1 and 100 so she can use a random sample. The computer produces the numbers: 1, 2, 3, 4, 5, and 6. Should she use these numbers or have the computer generate a new set of random numbers? Explain your reasoning.

4. A group of 100 people is divided into 5 groups with 20 people in each. One person's name is chosen, and everyone in their group wins a prize. Noah simulates this situation by writing 100 different names on papers and putting them in a bag, then drawing one out. Kiran suggests there is a way to do it with fewer paper slips. Explain a method that would simulate this situation with fewer than 100 slips of paper.

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5. Data collected from a survey of American teenagers aged 13 to 17 was used to estimate that 29% of teens believe in ghosts. This estimate was based on data from 510 American teenagers. What is the population that people carrying out the survey were interested in?

   A. All people in the United States.

   B. The 510 teens that were surveyed.

   C. All American teens who are between the ages of 13 and 17.

   D. The 29% of the teens surveyed who said they believe in ghosts.

6. A computer simulates flipping a coin 100 times, then counts the longest string of heads in a row.

trial	most heads in a row
1	8
2	6
3	5
4	11
5	13

Based on these results, estimate the probability that there will be at least 15 heads in a row.

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Unit 8, Lesson 15

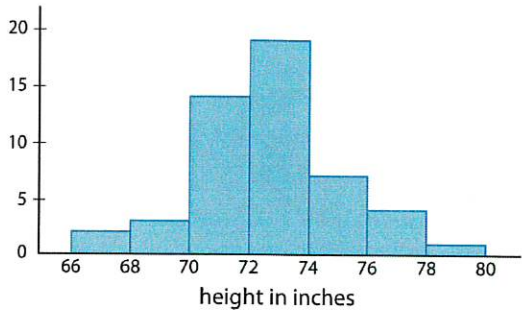
Estimating Population Measures of Center

Let's use samples to estimate measures of center for the population.

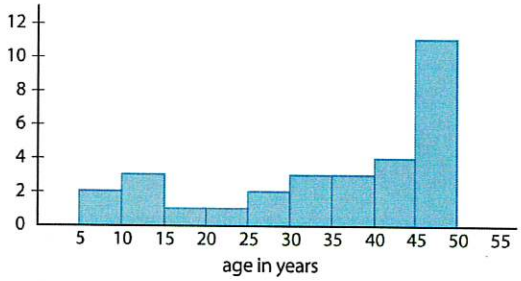
15.1 Describing the Center

Would you use the median or mean to describe the center of each data set? Explain your reasoning.

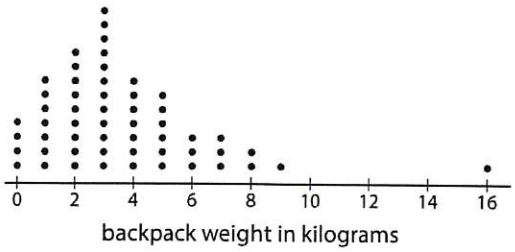
Heights of 50 basketball players



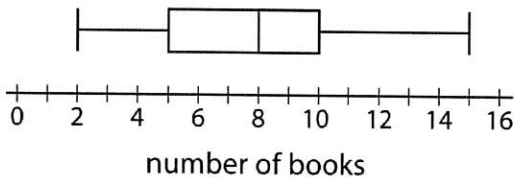
Ages of 30 people at a family dinner party



Backpack weights of sixth-grade students



How many books students read over summer break



NAME DATE PERIOD

15.2 Three Different TV Shows

Here are the ages (in years) of a random sample of 10 viewers for 3 different television shows. The shows are titled, "Science Experiments YOU Can Do," "Learning to Read," and "Trivia the Game Show."

sample 1	6	6	5	4	8	5	7	8	6	6
sample 2	15	14	12	13	12	10	12	11	10	8
sample 3	43	60	50	36	58	50	73	59	69	51

1. Calculate the mean for *one* of the samples. Make sure each person in your group works with a different sample. Record the answers for all three samples.

2. Which show do you think each sample represents? Explain your reasoning.

15.3 Who's Watching What?

Here are three more samples of viewer ages collected for these same 3 television shows.

sample 4	57	71	5	54	52	13	59	65	10	71
sample 5	15	5	4	5	4	3	25	2	8	3
sample 6	6	11	9	56	1	3	11	10	11	2

1. Calculate the mean for *one* of these samples. Record all three answers.

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2. Which show do you think each of these samples represents? Explain your reasoning.

3. For each show, estimate the mean age for all the show's viewers.

4. Calculate the mean absolute deviation for *one* of the shows' samples. Make sure each person in your group works with a different sample. Record all three answers.

	Learning to Read	**Science Experiments YOU Can Do**	**Trivia the Game Show**
Which sample number?			
MAD			

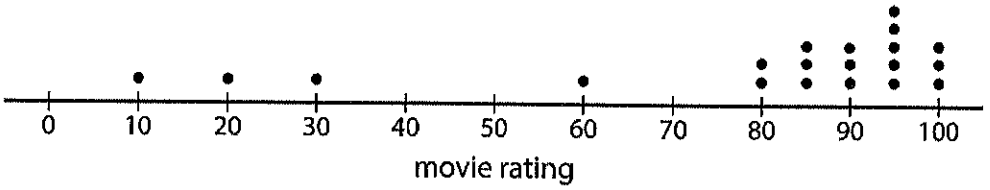
5. What do the different values for the MAD tell you about each group?

6. An advertiser has a commercial that appeals to 15- to 16-year-olds. Based on these samples, are any of these shows a good fit for this commercial? Explain or show your reasoning.

NAME DATE PERIOD

15.4 Movie Reviews

A movie rating website has many people rate a new movie on a scale of 0 to 100. Here is a dot plot showing a random sample of 20 of these reviews.



1. Would the mean or median be a better measure for the center of this data? Explain your reasoning.

2. Use the sample to estimate the measure of center that you chose for *all* the reviews.

3. For this sample, the mean absolute deviation is 19.6, and the interquartile range is 15. Which of these values is associated with the measure of center that you chose?

4. Movies must have an average rating of 75 or more from all the reviews on the website to be considered for an award. Do you think this movie will be considered for the award? Use the measure of center and measure of variability that you chose to justify your answer.

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Are you ready for more?

Estimate typical temperatures in the United States today by looking up current temperatures in several places across the country. Use the data you collect to decide on the appropriate measure of center for the country, and calculate the related measure of variation for your sample.

Lesson 15 Summary

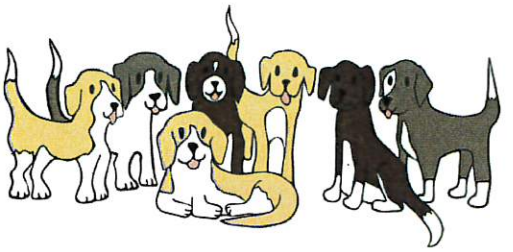
Some populations have greater variability than others. For example, we would expect greater variability in the weights of dogs at a dog park than at a beagle meetup.

Dog park:

- Mean weight: 12.8 kg
- MAD: 2.3 kg

Beagle meetup:

- Mean weight: 10.1 kg
- MAD: 0.8 kg



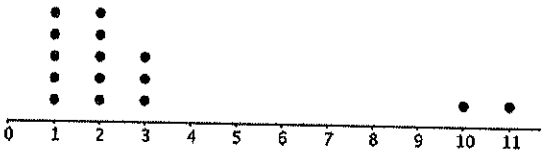
The lower MAD indicates there is less variability in the weights of the beagles. We would expect that the mean weight from a sample that is randomly selected from a group of beagles will provide a more accurate estimate of the mean weight of all the beagles than a sample of the same size from the dogs at the dog park.

In general, a sample of a similar size from a population with *less* variability is *more likely* to have a mean that is close to the population mean.

NAME DATE PERIOD

Unit 8, Lesson 15
Practice Problems

1. A random sample of 15 items were selected.



For this data set, is the mean or median a better measure of center? Explain your reasoning.

2. A video game developer wants to know how long it takes people to finish playing their new game. They surveyed a random sample of 13 players and asked how long it took them (in minutes).

1,235	952	457	1,486	1,759	1,148	548	1,037	1,864	1,245	976	866	1,431

a. Estimate the median time it will take *all* players to finish this game.

b. Find the interquartile range for this sample.

3. Han and Priya want to know the mean height of the 30 students in their dance class. They each select a random sample of 5 students.

- The mean height for Han's sample is 59 inches.
- The mean height for Priya's sample is 61 inches.

Does it surprise you that the two sample means are different? Are the population means different? Explain your reasoning.

NAME DATE PERIOD

4. Clare and Priya each took a random sample of 25 students at their school.
   - Clare asked each student in her sample how much time they spend doing homework each night. The sample mean was 1.2 hours and the MAD was 0.6 hours.
   - Priya asked each student in her sample how much time they spend watching TV each night. The sample mean was 2 hours and the MAD was 1.3 hours.

   a. At their school, do you think there is more variability in how much time students spend doing homework or watching TV? Explain your reasoning.

   b. Clare estimates the students at her school spend an average of 1.2 hours each night doing homework. Priya estimates the students at her school spend an average of 2 hours each night watching TV. Which of these two estimates is likely to be closer to the actual mean value for all the students at their school? Explain your reasoning.

NAME DATE PERIOD

Unit 8, Lesson 16

Estimating Population Proportions

Let's estimate population proportions using samples.

16.1 Getting to School

A teacher asked all the students in one class how many minutes it takes them to get to school. Here is a table of their responses:

20	10	15	8	5	15	10	5	20	5	15	10
3	10	18	5	25	5	5	12	10	30	5	10

1. What fraction of the students in this class say:

   a. it takes them 5 minutes to get to school?

   b. it takes them more than 10 minutes to get to school?

2. If the whole school has 720 students, can you use this data to estimate how many of them would say that it takes them more than 10 minutes to get to school?

   Be prepared to explain your reasoning.

NAME DATE PERIOD

16.3 A New Comic Book Hero

Here are the results of a survey of 20 people who read *The Adventures of Super Sam* regarding what special ability they think the new hero should have.

response	what new ability?
1	fly
2	freeze
3	freeze
4	fly
5	fly
6	freeze
7	fly
8	super strength
9	freeze
10	fly

response	what new ability?
11	freeze
12	freeze
13	fly
14	invisibility
15	freeze
16	fly
17	freeze
18	fly
19	super strength
20	freeze

1. What proportion of this sample want the new hero to have the ability to fly?

2. If there are 2,024 dedicated readers of *The Adventures of Super Sam*, estimate the number of readers who want the new hero to fly.

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Two other comic books did a similar survey of their readers.

- In a survey of people who read *Beyond Human*, 42 out of 60 people want a new hero to be able to fly.
- In a survey of people who read *Mysterious Planets*, 14 out of 40 people want a new hero to be able to fly.

"Flame 002" by Will Eisner (pencils) and Lou Fine (inks), uploaded by Roygbiv666 (Public Domain Super Heroes) via Wikimedia Commons. Public Domain.

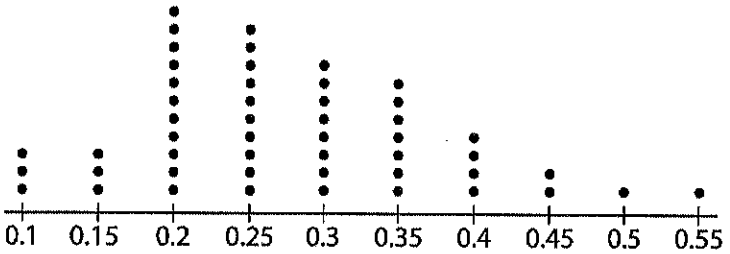
3. Do you think the proportion of all readers who want a new hero that can fly are nearly the same for the three different comic books? Explain your reasoning.

4. If you were in charge of these three comics, would you give the ability to fly to any of the new heroes? Explain your reasoning using the proportions you calculated.

NAME DATE PERIOD

16.4 Flying to the Shelves

The authors of *The Adventures of Super Sam* chose 50 different random samples of readers. Each sample was of size 20. They looked at the sample proportions who prefer the new hero to fly.



sample proportions for The Adventures of Super Sam

1. What is a good estimate of the proportion of *all* readers who want the new hero to be able to fly?

2. Are most of the sample proportions within 0.1 of your estimate for the population proportion?

3. If the comic book authors give the new hero the ability to fly, will that please most of the readers? Explain your reasoning.

The authors of the other comic book series created similar dot plots.

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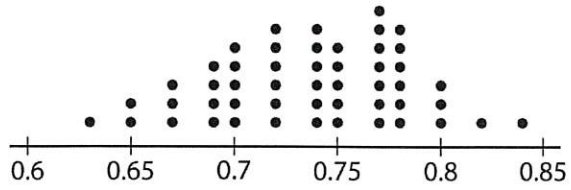
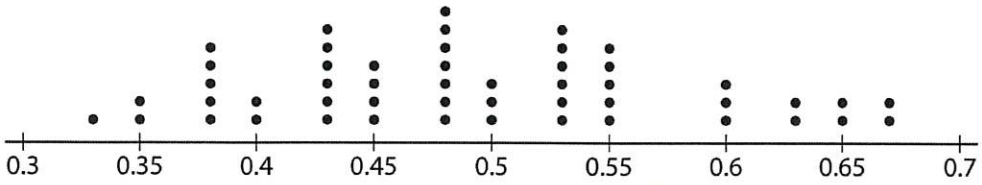


sample proportions for Beyond Human



sample proportions for Mysterious Planets

1. For each of these series, estimate the proportion of all readers who want the new hero to fly.

   a. *Beyond Human*:

   b. *Mysterious Planets*:

2. Should the authors of either of these series give their new hero the ability to fly?

3. Why might it be more difficult for the authors of *Mysterious Planets* to make the decision than the authors of the other series?

Are you ready for more?

Draw an example of a dot plot with at least 20 dots that represent the sample proportions for different random samples that would indicate that the population proportion is above 0.6, but there is a lot of uncertainty about that estimate.

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Lesson 16 Summary

Sometimes a data set consists of information that fits into specific categories. For example, we could survey students about whether they have a pet cat or dog. The categories for these data would be {neither, dog only, cat only, both}. Suppose we surveyed 10 students. Here is a table showing possible results:

option	number of responses
neither dog nor cat	2
dog only	4
cat only	1
both dog and cat	3

In this sample, 3 of the students said they have both a dog and a cat. We can say that the **proportion** of these students who have a both a dog and a cat is $\frac{3}{10}$ or 0.3. If this sample is representative of all 720 students at the school, we can predict that about $\frac{3}{10}$ of 720, or about 216 students at the school have both a dog and a cat.

In general, a proportion is a number from 0 to 1 that represents the fraction of the data that belongs to a given category.

Glossary Terms

proportion

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Unit 8, Lesson 16
Practice Problems

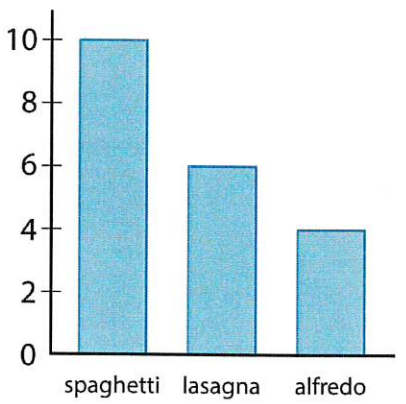
1. Tyler wonders what proportion of students at his school would dye their hair blue if their parents would let them. He surveyed a random sample of 10 students at his school, and 2 of them said they would. Kiran didn't think Tyler's estimate was very accurate, so he surveyed a random sample of 100 students, and 17 of them said they would.

   a. Based on Tyler's sample, estimate what proportion of the students would dye their hair blue.

   b. Based on Kiran's sample, estimate what proportion of the students would dye their hair blue.

   c. Whose estimate is more accurate? Explain how you know.

2. Han surveys a random sample of students about their favorite pasta dish served by the cafeteria and makes a bar graph of the results.



   Estimate the proportion of the students who like lasagna as their favorite pasta dish.

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3. Elena wants to know what proportion of people have cats as pets. Describe a process she could use to estimate an answer to her question.

4. The science teacher gives daily homework. For a random sample of days throughout the year, the median number of problems is 5 and the IQR is 2. The Spanish teacher also gives daily homework. For a random sample of days throughout the year, the median number of problems is 10 and the IQR is 1. If you estimate the median number of science homework problems to be 5 and the median number of Spanish problems to be 10, which is more likely to be accurate? Explain your reasoning.

5. Diego wants to survey a sample of students at his school to learn about the percentage of students who are satisfied with the food in the cafeteria. He decides to go to the cafeteria on a Monday and ask the first 25 students who purchase a lunch at the cafeteria if they are satisfied with the food.

   Do you think this is a good way for Diego to select his sample? Explain your reasoning.

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Unit 8, Lesson 17

More about Sampling Variability

Let's compare samples from the same population.

17.1 Average Reactions

The other day, you worked with the reaction times of twelfth graders to see if they were fast enough to help out at the track meet. Look back at the sample you collected.

1. Calculate the mean reaction time for your sample.

2. Did you and your partner get the same sample mean? Explain why or why not.

17.2 Reaction Population

Your teacher will display a blank dot plot.

1. Plot your sample mean from the previous activity on your teacher's dot plot.

2. What do you notice about the distribution of the sample means from the class?
   a. Where is the center?

   b. Is there a lot of variability?

   c. Is it approximately symmetric?

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3. The population mean is 0.442 seconds. How does this value compare to the sample means from the class?

Pause here so your teacher can display a dot plot of the population of reaction times.

4. What do you notice about the distribution of the population?

   a. Where is the center?

   b. Is there a lot of variability?

   c. Is it approximately symmetric?

5. Compare the two displayed dot plots.

6. Based on the distribution of sample means from the class, do you think the mean of a random sample of 20 items is likely to be:

   a. within 0.01 seconds of the actual population mean?

   b. within 0.1 seconds of the actual population mean?

Explain or show your reasoning.

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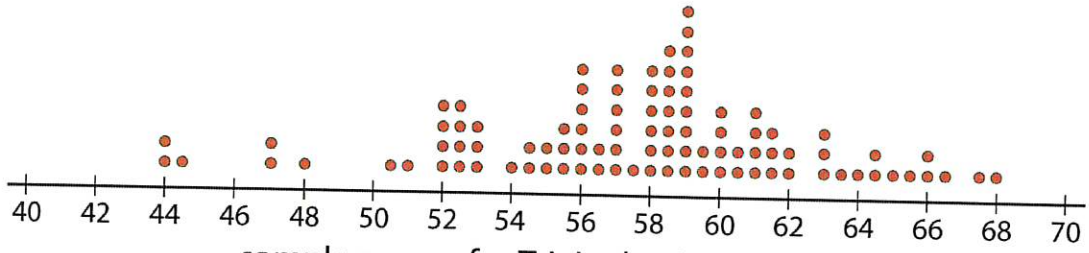
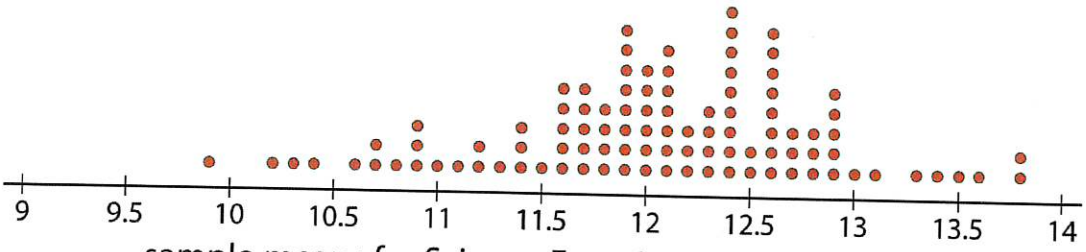
17.3 How Much Do You Trust the Answer?

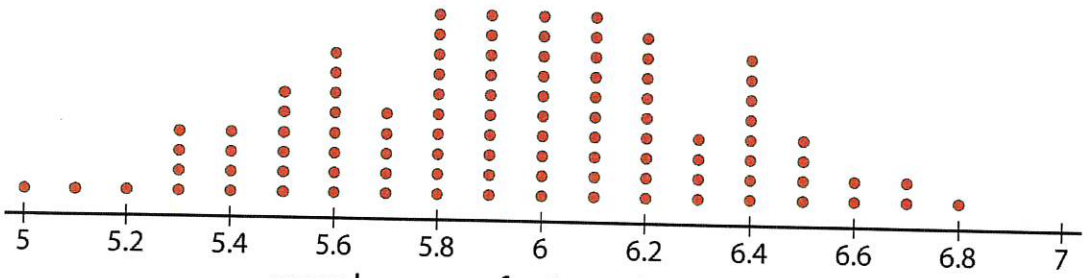
The other day you worked with 2 different samples of viewers from each of 3 different television shows. Each sample included 10 viewers. Here are the mean ages for 100 different samples of viewers from each show.



sample means for Trivia the Game Show



sample means for Science Experiments YOU Can Do



sample means for Learning to Read

1. For each show, use the dot plot to estimate the *population* mean.

   a. Trivia the Game Show

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b. Science Experiments YOU Can Do

c. Learning to Read

2. For each show, are most of the sample means within 1 year of your estimated population mean?

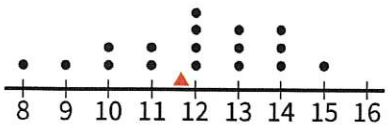
3. Suppose you take a new random sample of 10 viewers for each of the 3 shows. Which show do you expect to have the new sample mean closest to the population mean? Explain or show your reasoning.

Are you ready for more?

Market research shows that advertisements for retirement plans appeal to people between the ages of 40 and 55. Younger people are usually not interested and older people often already have a plan. Is it a good idea to advertise retirement plans during any of these three shows? Explain your reasoning.

Lesson 17 Summary

This dot plot shows the weights, in grams, of 18 cookies. The triangle indicates the mean weight, which is 11.6 grams.



cookie weights (grams)

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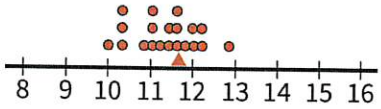
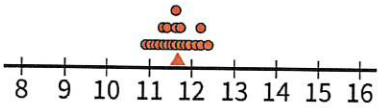
This dot plot shows the *means* of 20 samples of 5 cookies, selected at random. Again, the triangle shows the mean for the *population* of cookies. Notice that most of the sample means are fairly close to the mean of the entire population.



means of samples of size 5

This dot plot shows the means of 20 samples of 10 cookies, selected at random. Notice that the means for these samples are even closer to the mean for the entire population.



means of samples of size 10

In general, as the sample size gets bigger, the mean of a sample is more likely to be closer to the mean of the population.

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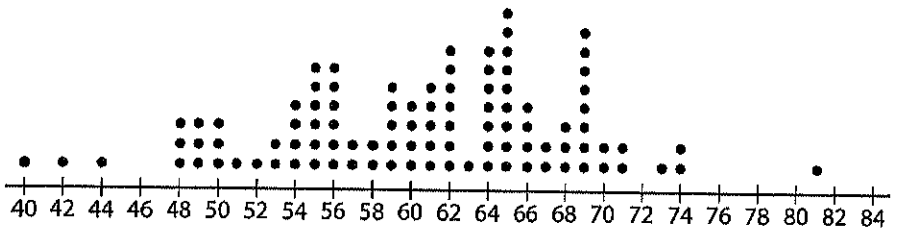
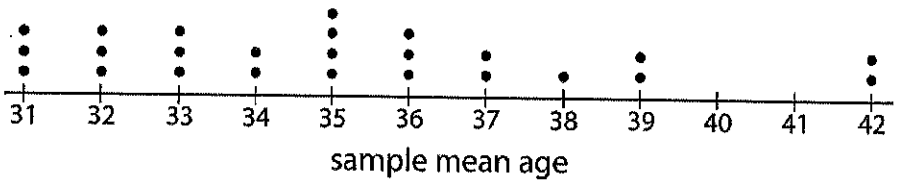
Unit 8, Lesson 17
Practice Problems

1. One thousand baseball fans were asked how far they would be willing to travel to watch a professional baseball game. From this population, 100 different samples of size 40 were selected. Here is a dot plot showing the mean of each sample.



Based on the distribution of sample means, what do you think is a reasonable estimate for the mean of the population?

2. Last night, everyone at the school music concert wrote their age on a slip of paper and placed it in a box. Today, each of the students in a math class selected a random sample of size 10 from the box of papers. Here is a dot plot showing their sample means, rounded to the nearest year.



a. Does the number of dots on the dot plot tell you how many people were at the concert or how many students are in the math class?

b. The mean age for the population was 35 years. If Elena picks a new sample of size 10 from this population, should she expect her sample mean to be within 1 year of the population mean? Explain your reasoning.

c. What could Elena do to select a random sample that is more likely to have a sample mean within 1 year of the population mean?

3. A random sample of people were asked which hand they prefer to write with.

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l means they prefer to use their left hand.

r means they prefer to use their right hand.

l	r	r	r	r	r	r	r	r	r	l	r	r	r	r

Based on this sample, estimate the proportion of the population that prefers to write with their left hand.

4. Andre would like to estimate the mean number of books the students at his school read over the summer break. He has a list of the names of all the students at the school, but he doesn't have time to ask every student how many books they read.

   What should Andre do to estimate the mean number of books?

5. A hockey team has a 75% chance of winning against the opposing team in each game of a playoff series. To win the series, the team must be the first to win 4 games.

   a. Design a simulation for this event.

   b. What counts as a successful outcome in your simulation?

   c. Estimate the probability using your simulation.

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Unit 8, Lesson 18

Comparing Populations Using Samples

Let's compare different populations using samples.

18.1 Same Mean? Same MAD?

Without calculating, tell whether each pair of data sets have the same mean and whether they have the same mean absolute deviation.

set A	1	3	3	5	6	8	10	14

set B	21	23	23	25	26	28	30	34

set X	1	2	3	4	5

set Y	1	2	3	4	5	6

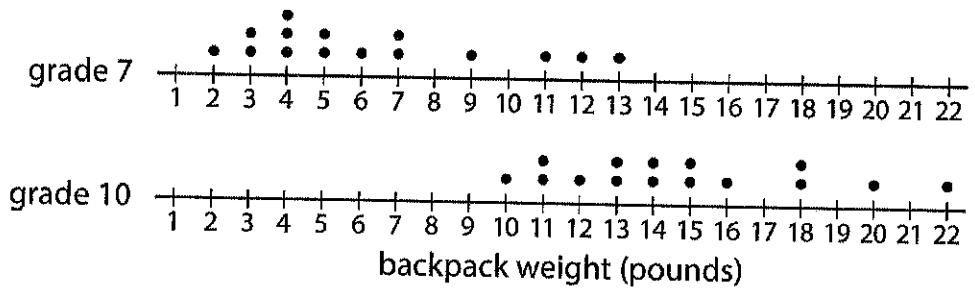
set P	47	53	58	62

set Q	37	43	68	72

18.2 With a Heavy Load

Consider the question: Do tenth-grade students' backpacks generally weigh more than seventh-grade students' backpacks?

Here are dot plots showing the weights of backpacks for a random sample of students from these two grades:



1. Did any seventh-grade backpacks in this sample weigh more than a tenth-grade backpack?

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2. The mean weight of this sample of seventh-grade backpacks is 6.3 pounds. Do you think the mean weight of backpacks for *all* seventh-grade students is exactly 6.3 pounds?

3. The mean weight of this sample of tenth-grade backpacks is 14.8 pounds. Do you think there is a meaningful difference between the weight of all seventh-grade and tenth-grade students' backpacks? Explain or show your reasoning.

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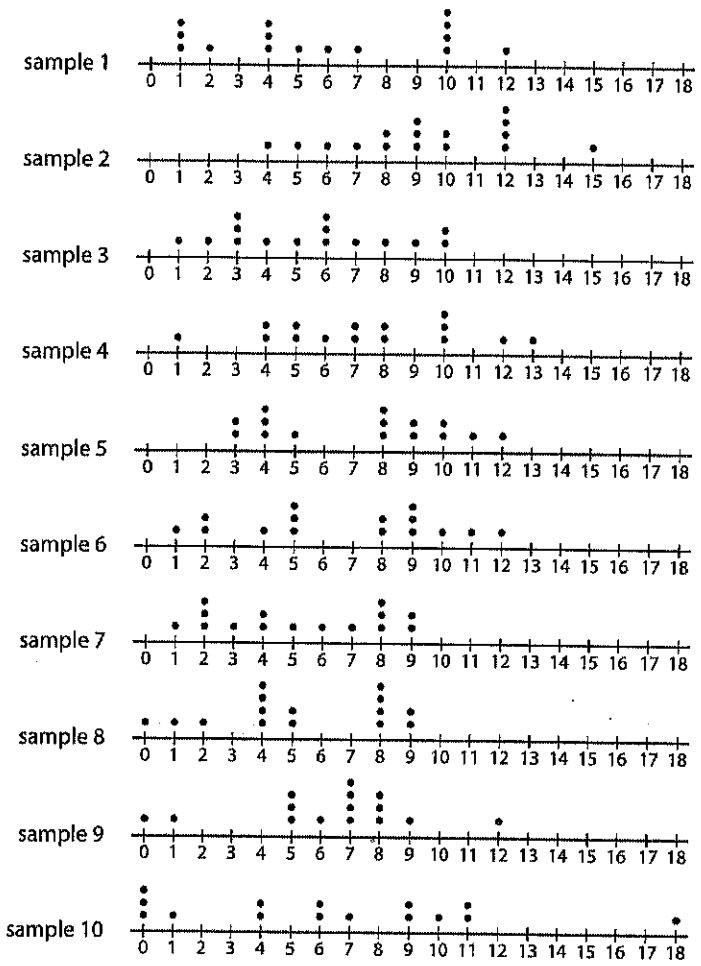
18.3 Do They Carry More?

Here are 10 more random samples of seventh-grade students' backpack weights.



sample number	mean weight (pounds)
1	5.8
2	9.2
3	5.5
4	7.3
5	7.2
6	6.6
7	5.2
8	5.2
9	6.3
10	6.4

1. a. Which sample has the highest mean weight?

   b. Which sample has the lowest mean weight?

   c. What is the difference between these two sample means?

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2. All of the samples have a mean absolute deviation of about 2.8 pounds. Express the difference between these two sample means as a multiple of the MAD.

3. Are these samples very different? Explain or show your reasoning.

Remember our sample of tenth-grade students' backpacks had a mean weight of 14.8 pounds. The MAD for this sample is 2.7 pounds. Your teacher will assign you one of the samples of seventh-grade students' backpacks to use.

4. a. What is the difference between the sample means for the tenth-grade students' backpacks and the seventh-grade students' backpacks?

   b. Express the difference between these two sample means as a multiple of the larger of the MADs.

5. Do you think there is a meaningful difference between the weights of all seventh-grade and tenth-grade students' backpacks? Explain or show your reasoning.

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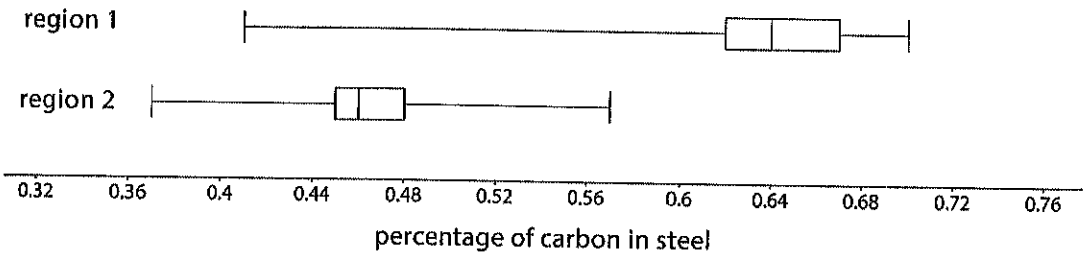
18.4 Steel from Different Regions

When anthropologists find steel artifacts, they can test the amount of carbon in the steel to learn about the people that made the artifacts. Here are some box plots showing the percentage of carbon in samples of steel that were found in two different regions:



1. Was there any steel found in region 1 that had:

   a. *more* carbon than some of the steel found in region 2?

   b. *less* carbon than some of the steel found in region 2?

2. Do you think there is a meaningful difference between all the steel artifacts found in regions 1 and 2?

3. Which sample has a distribution that is *not* approximately symmetric?

	sample median (%)	**IQR (%)**
region 1	0.64	0.05
region 2	0.47	0.03

4. What is the difference between the sample medians for these two regions?

5. Express the difference between these two sample medians as a multiple of the larger interquartile range.

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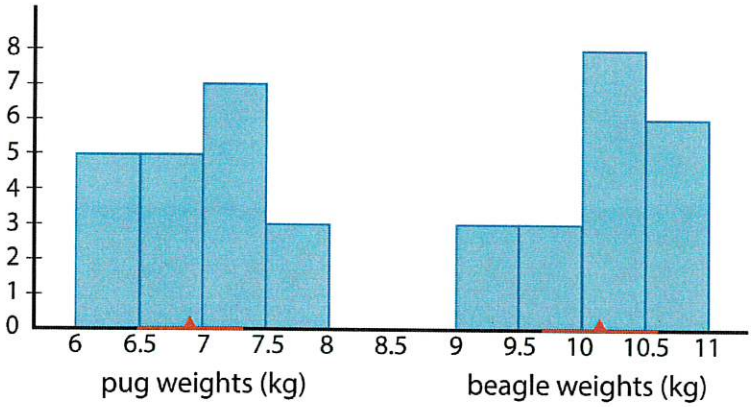
6. The anthropologists who conducted the study concluded that there was a meaningful difference between the steel from these regions. Do you agree? Explain or show your reasoning.

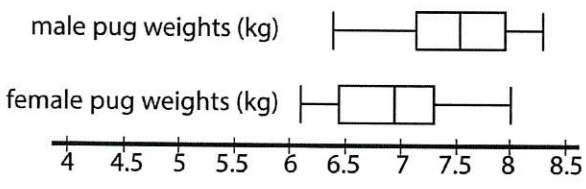
Lesson 18 Summary

Sometimes we want to compare two different populations. For example, is there a meaningful difference between the weights of pugs and beagles? Here are histograms showing the weights for a sample of dogs from each of these breeds:



The red triangles show the mean weight of each sample, 6.9 kg for the pugs and 10.1 kg for the beagles. The red lines show the weights that are within 1 MAD of the mean. We can think of these as "typical" weights for the breed. These typical weights do not overlap. In fact, the distance between the means is $10.1 - 6.9$ or 3.2 kg, over 6 times the larger MAD! So we can say there *is* a meaningful difference between the weights of pugs and beagles.

Is there a meaningful difference between the weights of male pugs and female pugs? Here are box plots showing the weights for a sample of male and female pugs:



We can see that the medians are different, but the weights between the first and third quartiles overlap. Based on these samples, we would say there is *not* a meaningful difference between the weights of male pugs and female pugs.

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In general, if the measures of center for two samples are at least two measures of variability apart, we say the difference in the measures of center is meaningful. Visually, this means the range of typical values does not overlap. If they are closer, then we don't consider the difference to be meaningful.

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Unit 8, Lesson 18
Practice Problems

1. Lin wants to know if students in elementary school generally spend more time playing outdoors than students in middle school. She selects a random sample of size 20 from each population of students and asks them how many hours they played outdoors last week. Suppose that the MAD for each of her samples is about 3 hours.

   Select **all** pairs of sample means for which Lin could conclude there is a meaningful difference between the two populations.

   A. elementary school: 12 hours, middle school: 10 hours

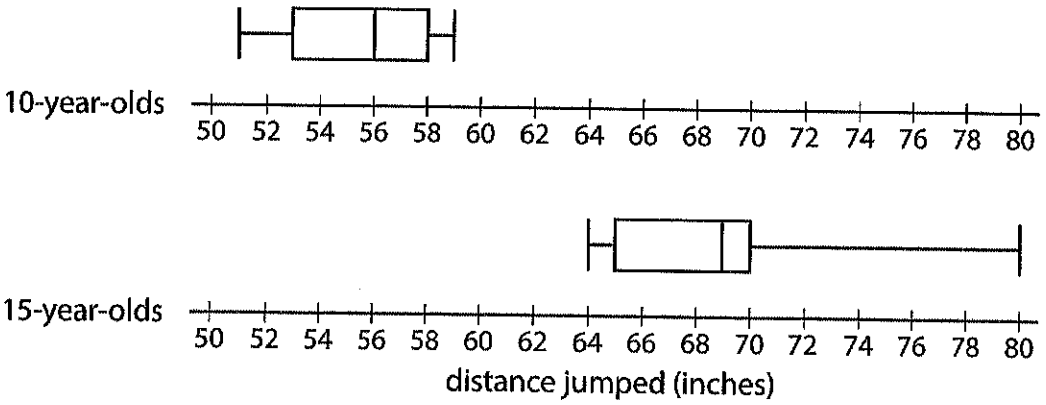
   B. elementary school: 14 hours, middle school: 9 hours

   C. elementary school: 13 hours, middle school: 6 hours

   D. elementary school: 13 hours, middle school: 10 hours

   E. elementary school: 7 hours, middle school: 15 hours

2. These two box plots show the distances of a standing jump, in inches, for a random sample of 10-year-olds and a random sample of 15-year-olds.



   Is there is a meaningful difference in median distance for the two populations? Explain how you know.

3. The median income for a sample of people from Chicago is about $60,000 and the median income for a sample of people from Kansas City is about $46,000, but

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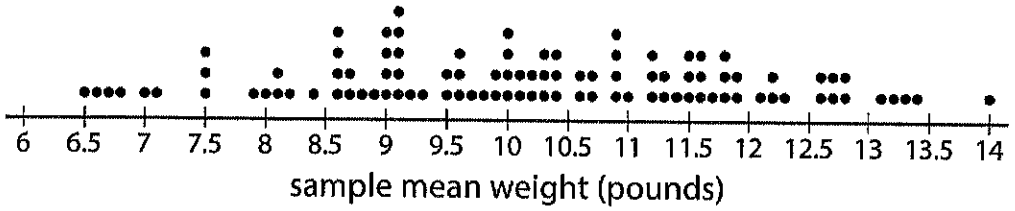
researchers have determined there is not a meaningful difference in the medians. Explain why the researchers might be correct.

4. A farmer grows 5,000 pumpkins each year. The pumpkins are priced according to their weight, so the farmer would like to estimate the mean weight of the pumpkins he grew this year. He randomly selects 8 pumpkins and weighs them. Here are the weights (in pounds) of these pumpkins:

weight (pounds)	2.9	6.8	7.3	7.7	8.9	10.6	12.3	15.3

a. Estimate the mean weight of the pumpkins the farmer grew.

This dot plot shows the mean weight of 100 samples of eight pumpkins, similar to the one above.



b. What appears to be the mean weight of the 5,000 pumpkins?

c. What does the dot plot of the sample means suggest about how accurate an estimate based on a single sample of 8 pumpkins might be?

d. What do you think the farmer might do to get a more accurate estimate of the population mean?

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Unit 8, Lesson 19

Comparing Populations With Friends

Let's ask important questions to compare groups.

19.1 Features of Graphic Representations

Dot plots, histograms, and box plots are different ways to represent a data set graphically.

Which of those displays would be the easiest to use to find each feature of the data?

1. the mean

2. the median

3. the mean absolute deviation

4. the interquartile range

5. the symmetry

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19.3 Comparing to Known Characteristics

1. A college graduate is considering two different companies to apply to for a job. Acme Corp lists this sample of salaries on their website:

$45,000	$55,000	$140,000	$70,000	$60,000	$50,000

What typical salary would Summit Systems need to have to be meaningfully different from Acme Corp? Explain your reasoning.

2. A factory manager is wondering whether they should upgrade their equipment. The manager keeps track of how many faulty products are created each day for a week.

6	7	8	6	7	5	7

The new equipment guarantees an average of 4 or fewer faulty products per day. Is there a meaningful difference between the new and old equipment? Explain your reasoning.

Lesson 19 Summary

When using samples to comparing two populations, there are a lot of factors to consider.

- Are the samples representative of their populations? If the sample is biased, then it may not have the same center and variability as the population.
- Which characteristic of the populations makes sense to compare—the mean, the median, or a proportion?
- How variable is the data? If the data is very spread out, it can be more difficult to make conclusions with certainty.

Knowing the correct questions to ask when trying to compare groups is important to correctly interpret the results.

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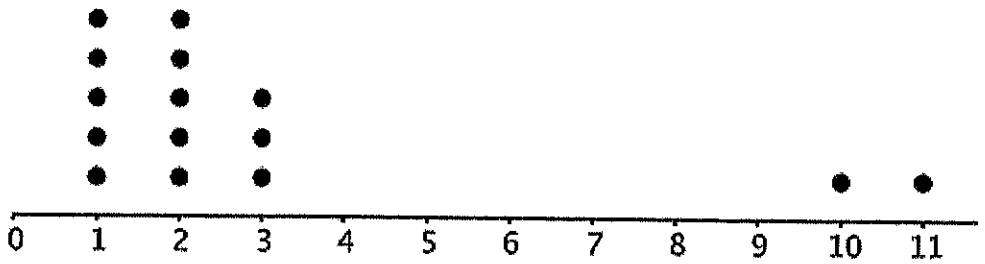
Unit 8, Lesson 19
Practice Problems

1. An agent at an advertising agency asks a random sample of people how many episodes of a TV show they watch each day. The results are shown in the dot plot.



The agency currently advertises on a different show, but wants to change to this one as long as the typical number of episodes is not meaningfully less.

a. What measure of center and measure of variation would the agent need to find for their current show to determine if there is a meaningful difference? Explain your reasoning.

b. What are the values for these same characteristics for the data in the dot plot?

c. What numbers for these characteristics would be meaningfully different if the measure of variability for the current show is similar? Explain your reasoning.

2. Jada wants to know if there is a meaningful difference in the mean number of friends on social media for teens and adults. She looks at the friend count for the 10 most popular of her friends and the friend count for 10 of her parents' friends. She then computes the mean and MAD of each sample and determines there is a meaningful difference. Jada's dad later tells her he thinks she has not come to the right conclusion. Jada checks her calculations and everything is right. Do you agree with her dad? Explain your reasoning.

3. The mean weight for a sample of a certain kind of ring made from platinum is 8.21 grams. The mean weight for a sample of a certain kind of ring made from gold is 8.61

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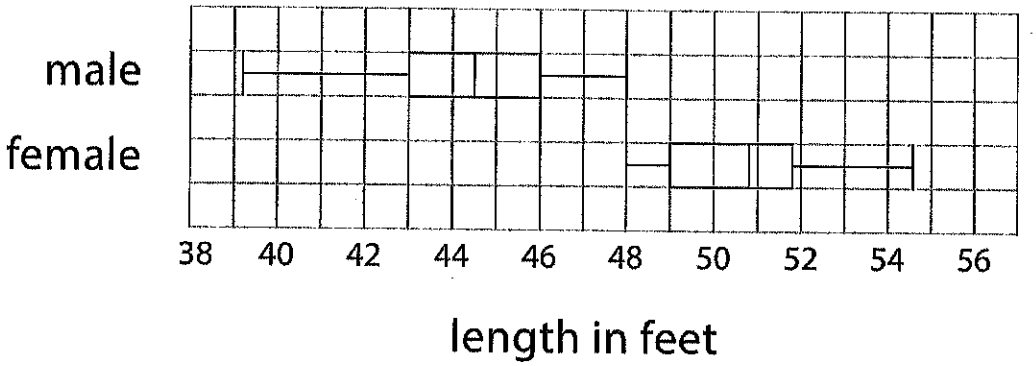
grams. Is there a meaningful difference in the weights of the two types of rings? Explain your reasoning.

4. The lengths in feet of a random sample of 20 male and 20 female humpback whales were measured and used to create the box plot.



Estimate the median lengths of male and female humpback whales based on these samples.

Data Set 1

	column 1	column 2	column 3	column 4	column 5	column 6	column 7	column 8	column 9	column 10
row 1	35	47	42*	33	42	57	40	39	33	37*
row 2	58	33*	55	42	66	10	47	44	45*	54
row 3	45	59	44	51	57	52*	42	42	43	22*
row 4	63	35	37	81	37*	11*	27	43	35*	43
row 5	95*	60*	41*	70*	64	47	34	63	40	41
row 6	47	39	57	71	46	53	63	57*	62	36
row 7	53	44	45	30	73*	39	54	48	30	39
row 8	29	36	27*	69	45	55	40	58*	62	42
row 9	34	49	61	18	40	40	52	54	45	26
row 10	65	35*	63	49	76	62	46*	42*	59	32

Use this Data Set for the next lesson (Lesson 20)

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Unit 8, Lesson 20

Memory Test

Let's put it all together.

20.1 Collecting a Sample

You teacher will give you a paper that lists a data set with 100 numbers in it. Explain whether each method of obtaining a sample of size 20 would produce a random sample.

Option 1: A spinner has 10 equal sections on it. Spin once to get the row number and again to get the column number for each member of your sample. Repeat this 20 times.

Option 2: Since the data looks random already, use the first two rows.

Option 3: Cut up the data and put them into a bag. Shake the bag to mix up the papers, and take out 20 values.

Option 4: Close your eyes and point to one of the numbers to use as your first value in your sample. Then, keep moving one square from where your finger is to get a path of 20 values for your sample.

20.2 Sample Probabilities

Continue working with the data set your teacher gave you in the previous activity. The data marked with a star all came from students at Springfield Middle School.

1. When you select the first value for your random sample, what is the probability that it will be a value that came from a student at Springfield Middle School?

NAME DATE PERIOD

2. What proportion of your entire sample would you expect to be from Springfield Middle School?

3. If you take a random sample of size 10, how many scores would you expect to be from Springfield Middle School?

4. Select a random sample of size 10.

5. Did your random sample have the expected number of scores from Springfield Middle School?

20.3 Estimating a Measure of Center for the Population

1. Decide which measure of center makes the most sense to use based on the distribution of your sample. Discuss your thinking with your partner. If you disagree, work to reach an agreement.

2. Estimate this measure of center for your population based on your sample.

3. Calculate the measure of variability for your sample that goes with the measure of center that you found.

20.4 Comparing Populations

Using only the values you computed in the previous two activities, compare your sample to your partner's.

NAME DATE PERIOD

Is it reasonable to conclude that the measures of center for each of your populations are meaningfully different? Explain or show your reasoning.

7th Grade Unit 8 Practice Assessment

NAME DATE PERIOD

~~Unit 8 End-of-Unit Assessment~~

Do not use a calculator. A standard number cube has the numbers 1 through 6 on its faces.

1. Elena would like to know the average height of seventh graders in her school district. She measures the heights of everyone in a random sample of 20 students. The mean height of Elena's sample is 61 inches, and the MAD (mean absolute deviation) is 2 inches.

   Select **all** the true statements.

   A. The median height of the sample must be between 59 and 63 inches.

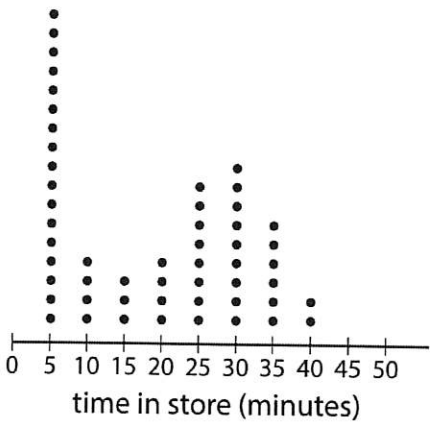
   B. Another random sample of 20 students is likely to have a mean between 57 and 65 inches.

   C. The mean height of these 20 students is likely to be the same as the mean height of all students in the district.

   D. The mean height of these 20 students is likely to be the same as the mean height of a second random sample of 20 students.

   E. Elena would be more likely to get an accurate estimate of the mean height of the population by sampling 40 people instead of sampling 20 people.

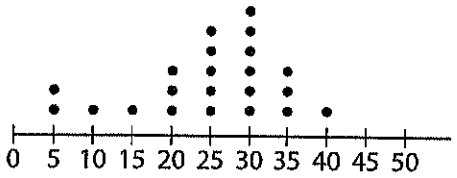
2. Below is a dot plot showing how much time customers spent in a store, rounded to the nearest five minutes.



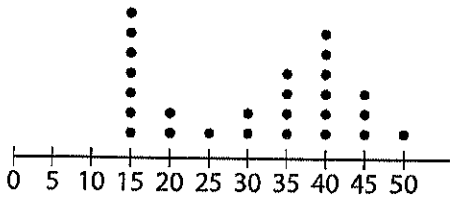
   Which of the following is a representative sample of this population?

NAME DATE PERIOD

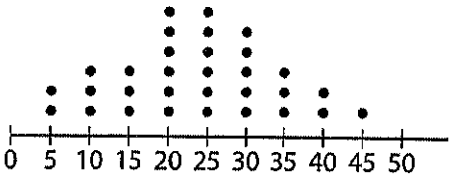
A



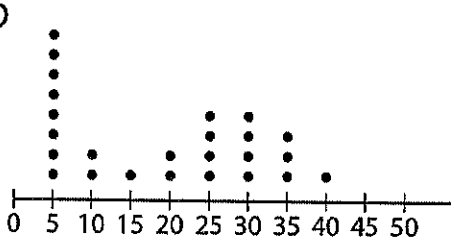
B



C



D



3. Diego predicts that his basketball team has a $\frac{2}{3}$ probability of winning each of their next 7 games.

   Select **all** the ways Diego could accurately simulate the number of games his team will win.

   A. Put the numbers 0 through 7 in a bag. Pick a number from the bag.

   B. Roll a standard number cube 7 times. Count the number of twos.

   C. Roll a standard number cube 7 times. Count the number of ones, twos, threes, and fours.

   D. Mark a spinner with 12 equally sized sections. Write "win" on 4 of the sections. Spin the spinner 7 times and count the number of times it ends on "win."

   E. Put 10 white chips and 5 red chips in a bag. Draw a chip from the bag, record its result, and put it back in the bag. Do this 7 times and count the total number of white chips drawn.

7th Grade

Week of 3/16	PD Day	Day 1		Day 2
Objective		SWBAT explain the difference between climate and weather and identify the components that define weather and climate (i.e. temperature, pressure, humidity, precipitation, and wind)		SWBAT review the water cycle SWBAT explain how gravity and the energy from the sun affect the water cycle
Assignment Read the pages assigned and answer any questions associated		p. 389 p. 462-463	p. 468-471 p. 300-301	p. 370-372 p. 460-461
To Be Graded		Day 1 Assignment		Day 2 Assignment

Week of 3/23	Day 3	Day 4
Objective	SWBAT explain the factors that affect climate	SWBAT explain how the geography of land, specifically mountains and altitude, affect rain and temperature patterns.
Assignment Read the pages assigned and answer any questions associated	Workbook pages 57-60	p. 392 Read about Rain Shadows
To Be Graded	Pages 59-60	Day 3 Assignment

Updated 3/18/2020

Week of 3/30	Day 5	Day 6	Day 7
Objective	SWBAT explain how the Earth's tilt causes unequal heating (temperatures) of the Earth creating latitudinal patterns	SWBAT explain how the ocean affects climates by: - Heating slower than land - Creating currents affecting the lands near them	SWBAT explain what makes up Earth's atmosphere and how the atmosphere contributes to the temperature on Earth.
Assignment Read the pages assigned and answer any questions associated	p. 390-391	In Readings Section p. 400-405 Article- Land Heats Faster than Water p. 1-2 Optional: Experiment	In Readings Section p. 416-419 p.434-437
To Be Graded	Day 4 Assignment	Day 6 Assignment p. 1-4 in Assignments Section	Day 7 Assignment p. 5-8 in Assignments Section

Week of 4/6	Day 8	Day 9
Objective	SWBAT explain how wind is created and how wind patterns are affected by the rotation of the Earth (Coriolis effect) SWBAT explain how wind contributes to weather patterns	**No Instruction Thursday/Friday Spring Break 4/9-4/13**
Assignment Read the pages assigned and answer any questions associated	In Readings Section p.442-448	
To Be Graded	Day 8 Assignment p. 9-12 in Assignments Section	

Updated 3/18/2020

READINGS

Why Does Land Heat and Cool Faster Than Water?

Land heats and cools faster than water for many different reasons. But one of the main reasons is the difference in molecular composition between land and water. Because of the movements of the molecules, it takes much longer for water to heat up or cool down. However, this is the simple answer, and there are more contributing factors. Read on to learn why water takes much longer to heat or cool, and also how this can affect weather patterns.

Water and Heat Conduction

Overall, water is a poor conductor of heat. When speaking about molecular composition, in part, this is what is meant. It takes much longer for water to conduct heat than it does land. Its molecules need to gain much more energy in order to heat up. Water also has a higher capacity for heat than land does. This is what is called "specific heat." Because of this, the solar power given off by the sun takes a much longer time to take effect — and water can get much hotter than regular landforms.

How Is Sand Warm and Ocean Water Cold?

The beach is a perfect example of how much more quickly land heats up than water. During the summer, sand can become so molten hot it's almost unbearable to walk on it, but ocean temperatures can still be icy cold. Land is a quick conductor of heat and energy, and therefore, land heats much faster. On the other hand, land loses its heat much faster. You can also look at the beach in the winter to see that there may be snow and ice on the beach, but of course, the ocean is not frozen.

More on Heating and Cooling

Land temperatures can easily vary by dozens of degrees during the day. An typical day during the spring or fall may have a low of 50 degrees Fahrenheit in the morning and a high of 80 in the afternoon. These air temperatures are not dissimilar from heating and cooling of land. However, during the day, water forms may only change in degree by a half degree, except for perhaps during the dog days of summer. Because of water's specific heat, water temperatures do not drop drastically at night but stay marginally the same, while land and air temperatures drop significantly during all seasons.

Why Are Coastal Areas Cooler?

You may notice that in the summer, inland temperatures may be scorching hot, while coastal areas remain cooler. This is directly caused by the ocean. Because water heats and cools more slowly and oceans only change by small amounts throughout the day or season, coastal areas remain cooler. In fact, heating and cooling differences between land and water affect the climate everywhere on earth.

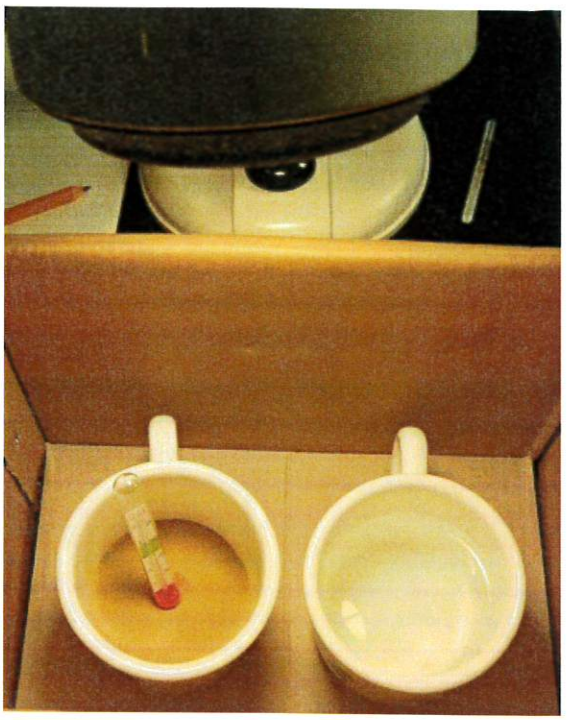
Land and Water Are Affected by Color

The heating differences between land and water are affected by other reasons beyond water's molecular composition and specific heat. Color also matters. Darker materials have a tendency to absorb more radiation (sun energy), and this, in turn, can make land masses hotter. As water is lighter in color than land as it is clear, it absorbs much less of the sun's rays.

Land and Water Are Also Affected by Texture

Texture also has a lot to do with the differences in heating and cooling of land and water. Rough, dry materials absorb more heat. When we talk about land, it's not just the landforms themselves. Cities make up quite a big part of the earth, and they are often mainly composed of asphalt and concrete, which both absorb more radiation. You can test this out by walking on a hot sidewalk and then walking in the grass beside it.

Specific Heat of Water vs. Specific Heat of Sand



Your feet may already know what **specific heat** is: Your toes felt nice and cool in the ocean on a summer day. Then, you decided to walk *barefoot* to the ice cream stand. The sand was much warmer than the ocean. The last part of the walk was the paved parking lot. Ouch! That black asphalt was hot. Your feet made you promise to throw on some flip flops next time.

Why, on the same day, are the temperatures of water, sand, and asphalt so different? Specific heat is the key. **Specific heat** is how much heat energy is needed raise the temperature of a substance. Water has a very high specific heat. That means it needs to absorb a lot of energy before its temperature changes. Sand and asphalt, on the other hand, have lower specific heats. This means that their temperatures change more quickly. When the summer sun shines down on them, they quickly become hot. In this experiment, you will use a light to add heat to samples of sand and water. Using a thermometer, you will be able to measure how much the temperature of each changes in a given amount of time.

Problem: How can the specific heats of different substances be observed and measured?

Materials

- Desk lamp
- Box
- Box cutter or scissors
- 2 non-paper cups
- 2 thermometers
- Sand
- Water

Procedure

1. Have a grown-up help you cut off one side of the box. You want to keep the heat energy of lamp enclosed in the area of your experiment as much as possible.
2. Fill one of the cups with sand and the other with water at room temperature.
3. Place the cups side by side in the bottom of the box.
4. Place the lamp behind the box and tilt the head so that when you turn it on, the light will shine down towards the cups. The bulb should be an equal distance away from each cup. *Why is this important?*
5. Do not turn your lamp on yet.
6. Place a thermometer about one inch into the sand. Place a second thermometer about one inch into the water.
7. Record the initial temperatures of the sand and water in a data table similar to the following.

Time in Minutes	Temperature Water	Temperature Sand
0		
2		
4		
6		
8		
10		
12		

16		
18		
20		

8. Turn on the light.
9. Record the temperature of both the sand and water every two minutes for at least 20 minutes. Be careful that the cups don't melt under the light bulb. If the temperatures don't seem like they're changing very much, try moving the light closer to the cups or using a light bulb of higher wattage.

Results

The sand will get warmer faster than the water.

Why?

It was important to make sure that the light was the same distance from the sand and water because you wanted each cup to receive the same amount of energy from the light. This is a **controlled experiment**, and the only variable you want to test is type of substance in the cup. Part of the reason the sand got hotter faster is because the specific heat of sand is lower than the specific heat of water. That's why it took less light energy to change its temperature.

Going Further

What other properties determine how fast a substance heats up? Try the same experiment with light and dark rock, or different types of liquids. You might also do the experiment in reverse, measuring how different substances cool over time.

Louisiana

LESSON 3

Currents and Climate

UNLOCK THE BIG ?

- What Causes Surface Currents?
  GLE 24 (ESS-M-A10); 25 (ESS-M-A11)
- What Causes Deep Currents?
  GLE 24 (ESS-M-A10); 25 (ESS-M-A11)

MY PLANET DIARY

EVERYDAY SCIENCE

Ducky Overboard

What happens when a ship loses its cargo at sea? Is it gone forever? You might think so. One ship traveling from Hong Kong to Tacoma, Washington, lost 29,000 plastic toys. They fell overboard in a storm and were considered lost at sea. But when hundreds of the toys began washing up on distant shores, scientists got excited.

One way scientists study ocean currents is by releasing empty bottles into the ocean. But of 500 to 1,000 bottles released, scientists might only recover 10. That doesn't give them much data. The large number of floating toys could give scientists better data from more data points.

The first toys were spotted off the coast of Alaska. Then beachcombers began finding them in Canada, in Washington, and even as far away as Scotland.

Discuss these questions with a classmate and write your answers below.

1. Why was the plastic toy spill so helpful to scientists studying ocean currents?

_____

_____

_____

2. Have you ever found objects on the beach? What data would scientists need from you for their research?

_____

_____

PLANET DIARY Go to **Planet Diary** to learn more about ocean currents.

Lab zone® Do the Inquiry Warm-Up *Bottom to Top.*

Vocabulary

- current
- Coriolis effect
- climate
- El Niño
- La Niña

Skills

- Reading: Compare and Contrast
- Inquiry: Infer

What Causes Surface Currents?

A **current** is a large stream of moving water that flows through the oceans. Unlike waves, currents carry water from one place to another. Some currents move water at the surface of the ocean. Other currents move water deep in the ocean.

Surface currents affect water to a depth of several hundred meters. They are driven mainly by winds. Surface currents follow Earth's major wind patterns. They move in circular patterns in the five major oceans. Most of the currents flow east or west, then double back to complete the circle, as shown in **Figure 1.**

Grade 8 Grade Level Expectations

GLE 24 Investigate and explain how given factors affect the rate of water movement in the water cycle (e.g., climate, type of rock, ground cover). (ESS-M-A10)

GLE 25 Explain and give examples of how climatic conditions on Earth are affected by the proximity of water. (ESS-M-A11)

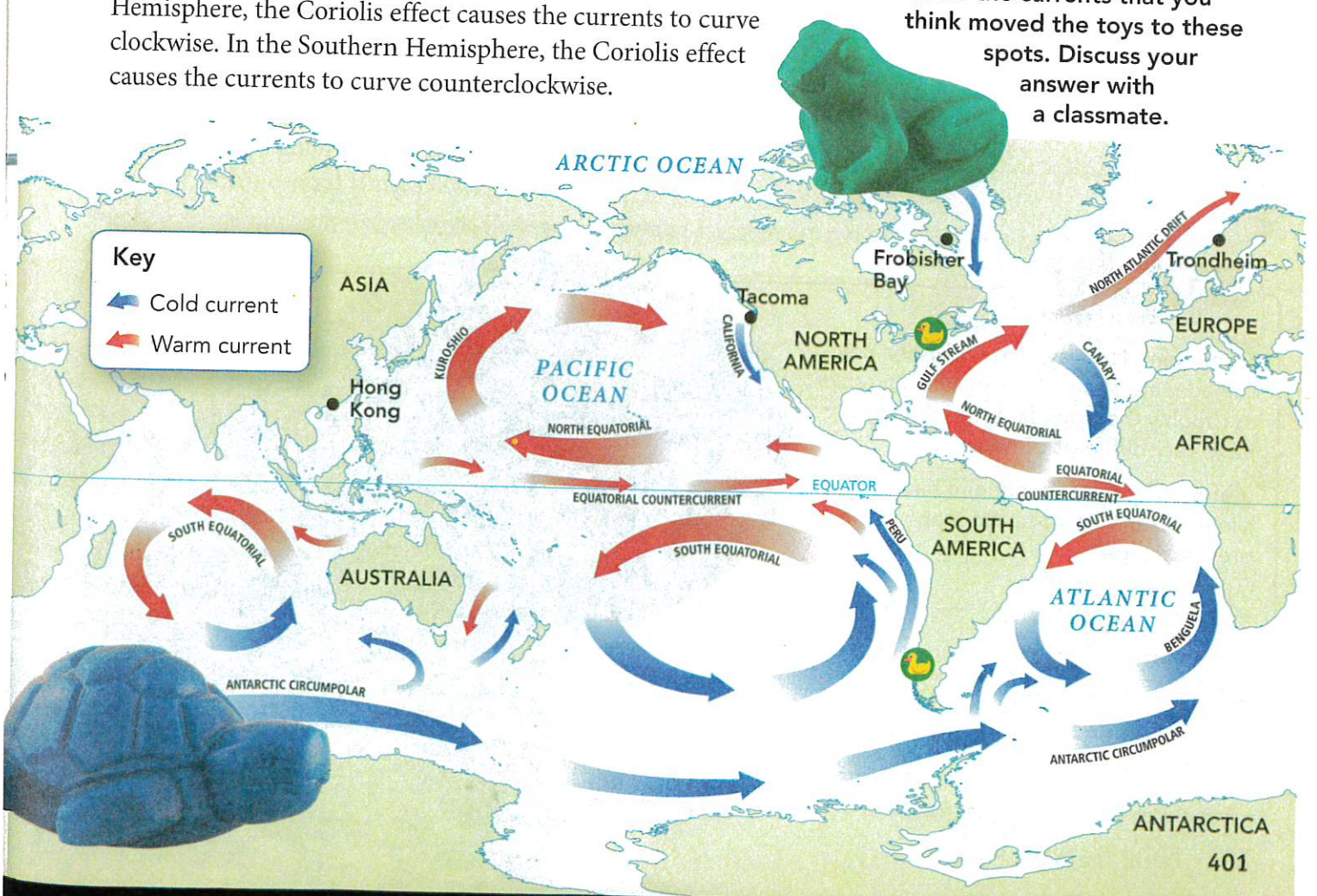
Coriolis Effect

Why do the currents move in these circular patterns? If Earth were standing still, winds and currents would flow in more direct paths between the poles and the equator. But as Earth rotates, the paths of the winds and currents curve. This effect of Earth's rotation on the direction of winds and currents is called the **Coriolis effect** (kawr ee OH lis). In the Northern Hemisphere, the Coriolis effect causes the currents to curve clockwise. In the Southern Hemisphere, the Coriolis effect causes the currents to curve counterclockwise.

FIGURE 1

Surface Currents

Infer The toys that fell overboard washed up in many places. Two of the locations are marked with ducks below. Circle the currents that you think moved the toys to these spots. Discuss your answer with a classmate.



Compare and Contrast Use the space below to compare and contrast the effects of warm and cold currents on climate.

Gulf Stream

The Gulf Stream is the largest and most powerful surface current in the North Atlantic Ocean. This current is caused by strong winds from the west. It is more than 30 kilometers wide and 300 meters deep. The Gulf Stream moves warm water from the Gulf of Mexico to the Caribbean Sea. It then continues northward along the east coast of the United States. Near Cape Hatteras, North Carolina, it curves eastward across the Atlantic, as a result of the Coriolis effect. When the Gulf Stream crosses the Atlantic it becomes the North Atlantic Drift.

Effects on Climate

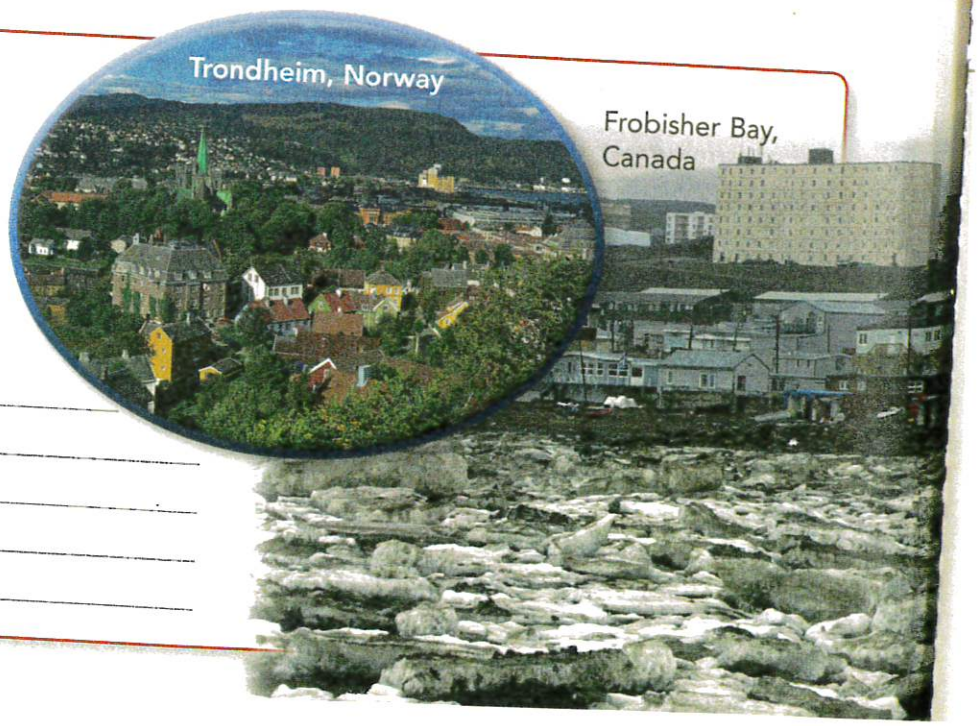
The Gulf Stream has a warming effect on the climate of nearby land areas. **Climate** is the pattern of temperature and precipitation typical of an area over a long period of time. The mid-Atlantic region of the United States, including North Carolina and Virginia, has a more moderate climate because of the Gulf Stream. Winters are very mild and summers are humid.

Currents affect climate by moving cold and warm water around the globe. Currents generally move warm water from the tropics toward the poles and bring cold water back toward the equator. **A surface current warms or cools the air above it. This affects the climate of land near the coast.** Winds pick up moisture as they blow across warm-water currents. This explains why the warm Kuroshio Current brings mild, rainy weather to the southern islands of Japan. Cold-water currents cool the air above them. Cold air holds less moisture than warm air. So cold currents tend to bring cool, dry weather to land areas in their path.

apply it!

Trondheim, Norway, and Frobisher Bay, Canada, are shown here in July. They are at roughly the same latitude, but they have very different climates.

Infer Why does Trondheim have a mild climate? *Hint:* Refer to the map on the previous page.



El Niño Changes in wind patterns and currents can have a major impact on the oceans and nearby land. One example of such changes is **El Niño,** a climate event that occurs every two to seven years in the Pacific Ocean. El Niño begins when an unusual pattern of winds forms over the western Pacific. This causes a vast sheet of warm water to move east toward the South American coast, as shown in **Figure 2.** This warm water prevents the cold deep water from moving to the surface. El Niño conditions can last for one to two years before the usual winds and currents return.

El Niño causes shifts in weather patterns. This leads to unusual and often severe conditions in different areas. A major El Niño occurred between 1997 and 1998. It caused an especially warm winter in the northeastern United States. It was also responsible for heavy rains, flooding, and mudslides in California, as well as a string of deadly tornadoes in Florida.

La Niña When surface waters in the eastern Pacific are colder than normal, a climate event known as **La Niña** occurs. A La Niña event is the opposite of an El Niño event. La Niña events typically bring colder than normal winters and greater precipitation to the Pacific Northwest and the north central United States.

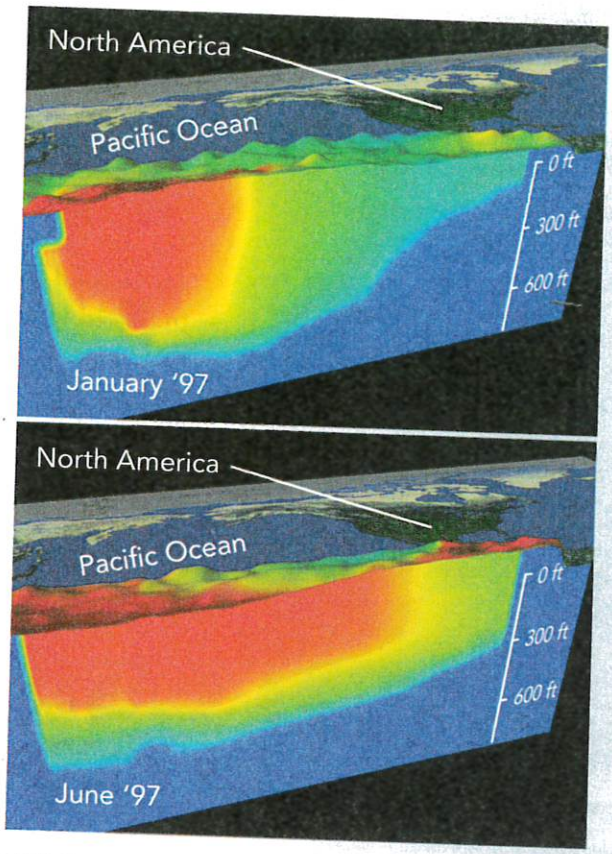


FIGURE 2

ART IN MOTION **Warming Sea Temperature**
The images show what happens to temperature below the surface of the ocean during an El Niño event. Red indicates a warmer sea surface temperature.

Draw Conclusions **What happened to the the water temperature over six months?**

Assess Your Understanding

Lab zone® Do the Lab Investigation *Modeling Ocean Currents.*

1a. Define What is a current?

GLE 24

b. Describe What causes surface currents?

GLE 25

c. CHALLENGE Why is it helpful to a community to be able to predict an El Niño event?

GLE 25

got it?

○ I get it! Now I know that currents are driven mainly by

○ I need extra help with

Go to MY SCIENCE COACH *online for help with this subject.*

GLE 24, 25

Grade 8 Grade Level Expectations

GLE 24 Investigate and explain how given factors affect the rate of water movement in the water cycle (e.g., climate, type of rock, ground cover). (ESS-M-A10)

GLE 25 Explain and give examples of how climatic conditions on Earth are affected by the proximity of water. (ESS-M-A11)

What Causes Deep Currents?

Deep below the ocean surface, another type of current causes chilly waters to creep slowly across the ocean floor. **Deep currents are caused by differences in the density of ocean water.** Recall that cold water is more dense than warm water.

Salinity When a warm surface current moves from the equator toward one of the poles, it gradually cools. As ice forms near the poles, the salinity of the water increases from the salt left behind during freezing. As the water's temperature decreases and its salinity increases, the water becomes denser and sinks. Then, the cold water flows back along the ocean floor as a deep current. Deep currents are affected by the Coriolis effect, which causes them to curve.

Deep currents move and mix water around the world. They carry cold water from the poles toward the equator. Deep currents flow slowly. They may take as long as 1,000 years to circulate between the oceans back to where they started.

Global Ocean Conveyor The simplified pattern of ocean currents in **Figure 3** looks like a conveyor belt, moving water between the oceans. This pattern of ocean currents results from density differences due to temperature and salinity. The currents bring oxygen into the deep ocean that is needed for marine life.

The ocean's deep currents mostly start as cold water in the North Atlantic Ocean. This is the same water that moved north across the Atlantic as part of the Gulf Stream. This cold, salty water, called the North Atlantic Deep Water, is dense. It sinks to the bottom of the ocean and flows southward toward Antarctica. From there it flows northward into both the Indian and Pacific oceans. The deep cold water rises to the surface in the Indian and Pacific oceans, warms, and eventually flows back along the surface into the Atlantic.

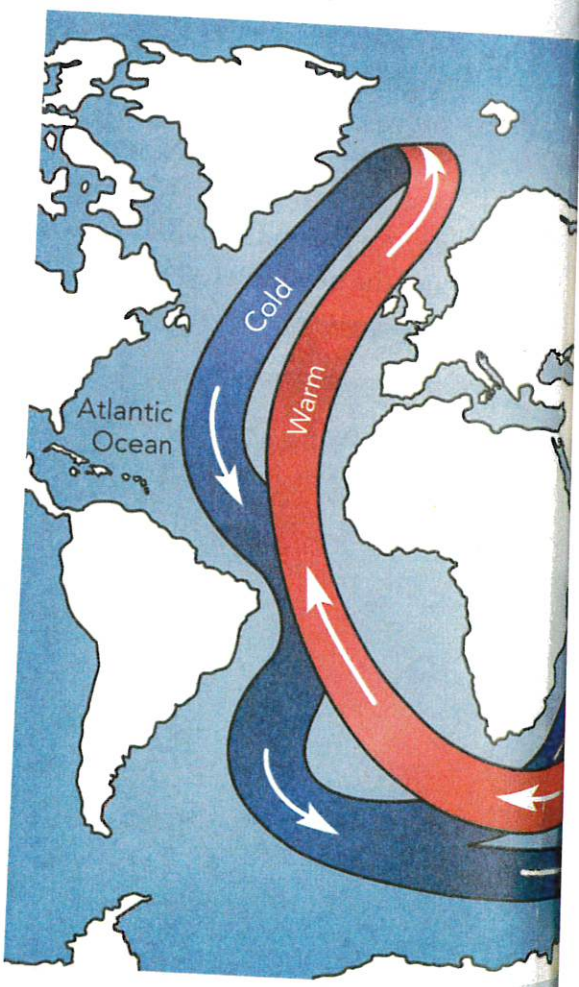


FIGURE 3

Global Conveyor

Predict What might happen if the global conveyor stopped?

do the math! Analyzing Data

Calculating Density

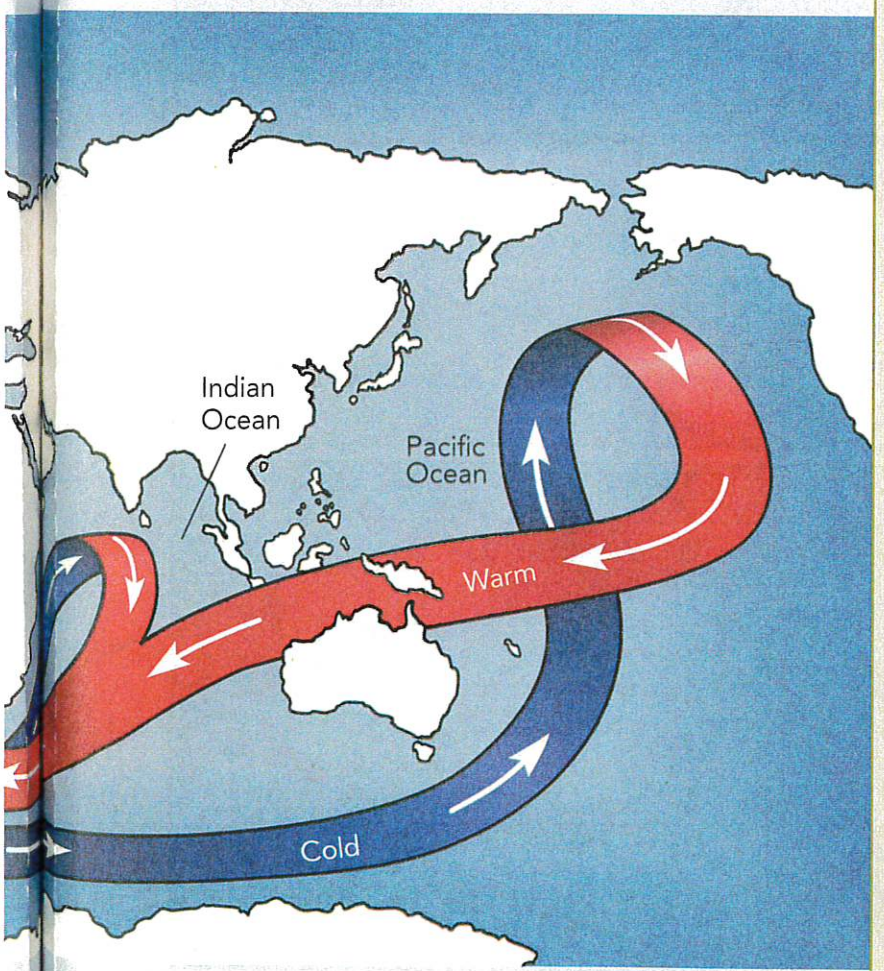
Temperature affects the density of ocean water. To calculate the density of a substance, divide the mass of the substance by its volume.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Practice Problem

Calculate Find the density of the following 1-L samples of ocean water. Sample A has a mass of 1.01 kg; Sample B has a mass of 1.06 kg. Which sample is likely to have the higher salinity? Why?

Mathematics GLE 18 (M-1-M) (N-8-M) (M-6-M)



Lab zone® Do the Quick Lab *Deep Currents.*

Assess Your Understanding

2a. Review What causes deep currents?

GLE 24

b. Explain How does the temperature of ocean water affect its density?

GLE 25

got it?

○ I get it! Now I know how the global ocean conveyor moves: _____

○ I need extra help with _____

Go to my science coach *online for help with this subject.* GLE 24, 25

Louisiana

LESSON 1

The Air Around You

UNLOCK THE BIG ?

- What Is the Composition of Earth's Atmosphere?
  GLE 26 (ESS-M-A11)
- How Is the Atmosphere a System?
  GLE 27 (ESS-M-A12)

MY PLANET DIARY

VOICES FROM HISTORY

Antoine Lavoisier

French chemist Antoine Lavoisier was determined to solve a puzzle: How could a metal burned to a powder weigh more than the original metal? In his 1772 lab notes he observed, "Sulphur, in burning . . . gains weight." So did mercury. Lavoisier thought a gas in the air was combining with the mercury as it burned, making it heavier. Then he heated the mercury powder to a higher temperature. It turned back to liquid mercury and a gas. Lavoisier observed that a mouse exposed to the gas could breathe it. He named the gas *principe oxygine*. Today we call it oxygen.

Discuss Lavoisier's experiment with a partner and answer the question below.

Why do you think Lavoisier exposed a mouse to the gas he collected from the mercury?

PLANET DIARY Go to **Planet Diary** to learn more about air.

Lab zone® Do the Inquiry Warm-Up *How Long Will the Candle Burn?*

Grade 8 Grade Level Expectation

GLE 26 Describe and illustrate the layers of Earth's atmosphere. (ESS-M-A11)

What Is the Composition of Earth's Atmosphere?

The sun disappears behind thick, dark clouds. In the distance you see a bright flash. Then you hear a crack of thunder. You make it home just as the downpour begins. The weather changed quickly—that was close!

Weather is the condition of Earth's atmosphere at a particular time and place. But what is the atmosphere? Earth's **atmosphere** (AT muh sfeer) is the envelope of gases that surrounds the planet.

Earth's atmosphere consists of nitrogen, oxygen, carbon dioxide, water vapor, and other gases, as well as particles of liquids and solids.

Vocabulary

- weather
- atmosphere
- water vapor

Skills

- Reading: Summarize
- Inquiry: Infer

Nitrogen The most abundant gas in the atmosphere is nitrogen. It makes up a little more than three fourths of the air we breathe. Nitrogen occurs in all living things and makes up about 3 percent of the weight of the human body.

Oxygen Although oxygen is the second most abundant gas in the atmosphere, it makes up only about 21 percent of the volume. Plants and animals take oxygen directly from the air and use it to release energy from their food.

Oxygen is also involved in many other processes. A fire uses oxygen rapidly as it burns. Without oxygen, a fire will go out. Some processes use oxygen more slowly. Steel in cars and other objects reacts slowly with oxygen to form iron oxide, or rust.

Carbon Dioxide Carbon dioxide makes up much less than 1 percent of the atmosphere, but it is essential to life. Plants must have carbon dioxide to produce food. The cells of animals break down food and give off carbon dioxide as a waste product.

When fuels like coal and gasoline are burned, they also release carbon dioxide. Burning these fuels increases the amount of carbon dioxide in the atmosphere.

Other Gases Oxygen and nitrogen together make up 99 percent of dry air. Argon makes up most of the other 1 percent. The remaining gases are called trace gases because only small amounts of them are present.

FIGURE 1

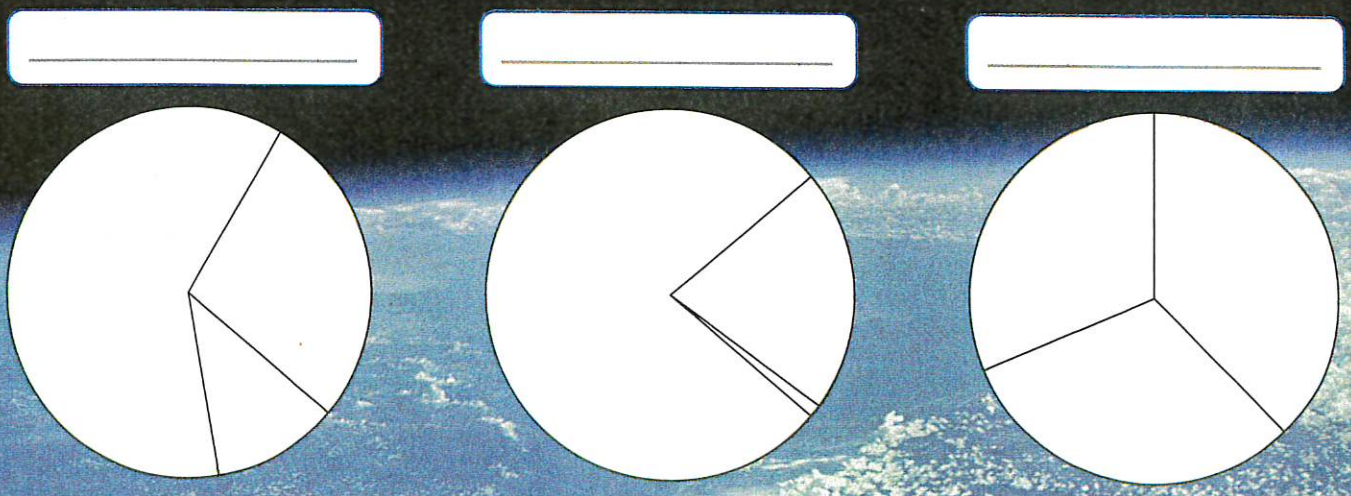
Gases in the Air

The atmosphere is a thin layer of gases.

Graph Identify which circle graph shows the correct percentage of gases in the atmosphere. Shade in the key and the graph. Give your graph a title.

Key

- ☐ Nitrogen
- ☐ Oxygen
- ☐ Other gases

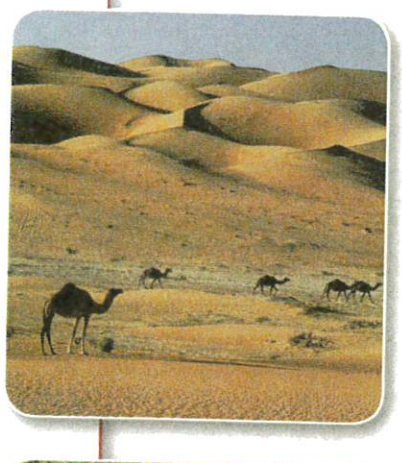


apply it!

The amount of water vapor in the air can differ from place to place.

1. There is more water vapor in the (desert/rain forest) than in the (desert/rain forest).

2. **Infer** What evidence do you see for your answer to Question 1?



3. **CHALLENGE** What factors might affect the amount of water vapor in the air?

Water Vapor So far, we've discussed the composition of dry air. But in reality, air is not dry. Air contains **water vapor**—water in the form of a gas. Water vapor is invisible. It is not the same thing as steam, which is made up of tiny droplets of liquid water.

The amount of water vapor in the air varies greatly from place to place and from time to time. Water vapor plays an important role in Earth's weather. Clouds form when water vapor condenses out of the air to form tiny droplets of liquid water or crystals of ice. If these droplets or crystals become heavy enough, they fall as rain or snow.

Particles Pure air contains only gases. But pure air exists only in laboratories. In the real world, air contains tiny solid and liquid particles of dust, smoke, salt, and chemicals. You can see some of these particles in the air around you, but most of them are too small to see.

Lab zone® Do the Quick Lab *Breathe In, Breathe Out.*

Assess Your Understanding

1a. Define The _____ is the envelope of _____ that surrounds Earth. GLE 26

b. List What are the four most common gases in dry air?

_____

_____ GLE 26

c. Compare and Contrast What is the difference between wet air and dry air?

_____

_____ GLE 26

got it?

○ **I get it!** Now I know that the atmosphere is made up of _____

_____

_____

_____

_____

○ I need extra help with _____

_____

Go to MY SCIENCE COACH *online for help with this subject.* GLE 26

How Is the Atmosphere a System?

Grade 8 Grade Level Expectation

GLE 27 Identify different air masses, jet streams, global wind patterns, and other atmospheric phenomena and describe how they relate to weather events, such as El Niño and La Niña. (ESS-M-A12)

The atmosphere is a system that interacts with other Earth systems, such as the ocean. The atmosphere has many different parts. Some of these parts you can actually see, such as clouds. But most parts of the atmosphere—like air, wind, and energy—you can't see. Instead, you might feel a wind when it blows on you. Or you might feel energy from the sun warming your face on a cool winter day.

At first, the wind that blows and the heat you feel may seem unrelated. But as you'll learn, the different parts of the atmosphere interact with one another. **Events in one part of the atmosphere affect other parts of the atmosphere.**

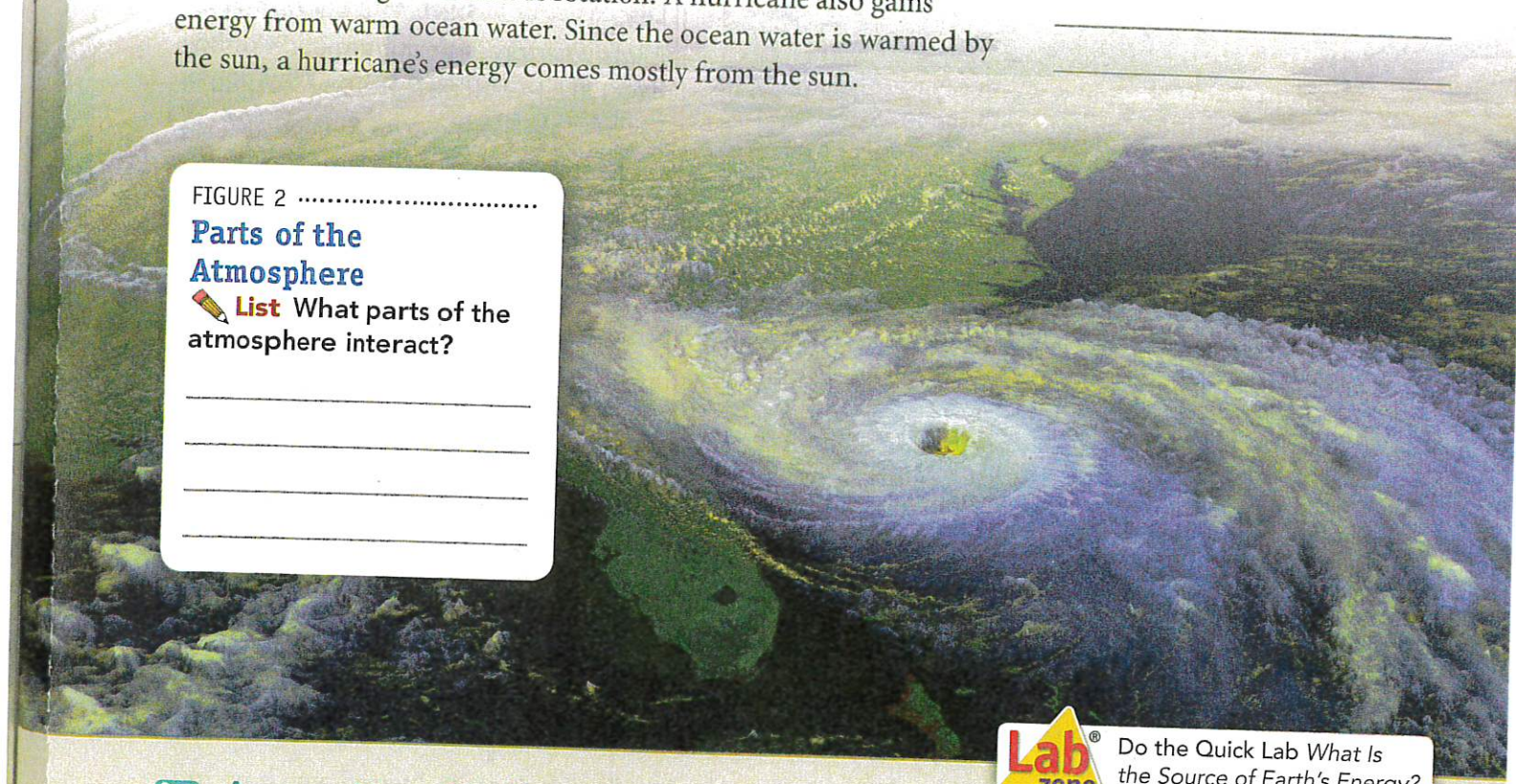
Energy from the sun drives the motions in the atmosphere. A storm such as the hurricane in **Figure 2,** involves a tremendous amount of energy. The spiraling shape of a hurricane is due in part to forces resulting from Earth's rotation. A hurricane also gains energy from warm ocean water. Since the ocean water is warmed by the sun, a hurricane's energy comes mostly from the sun.

Summarize Write a short summary of the third paragraph.

FIGURE 2

Parts of the Atmosphere

List What parts of the atmosphere interact?



Lab zone® Do the Quick Lab *What Is the Source of Earth's Energy?*

Assess Your Understanding

got it?

- ○ I get it! Now I know that events in one part of the atmosphere _____
- ○ I need extra help with _____

Go to my science coach *online for help with this subject.*

GLE 27

Grade 8 Grade Level Expectation

GLE 27 Identify different air masses, jet streams, global wind patterns, and other atmospheric phenomena and describe how they relate to weather events, such as El Niño and La Niña. (ESS-M-A12)

What Happens to the Sun's Energy When It Reaches Earth?

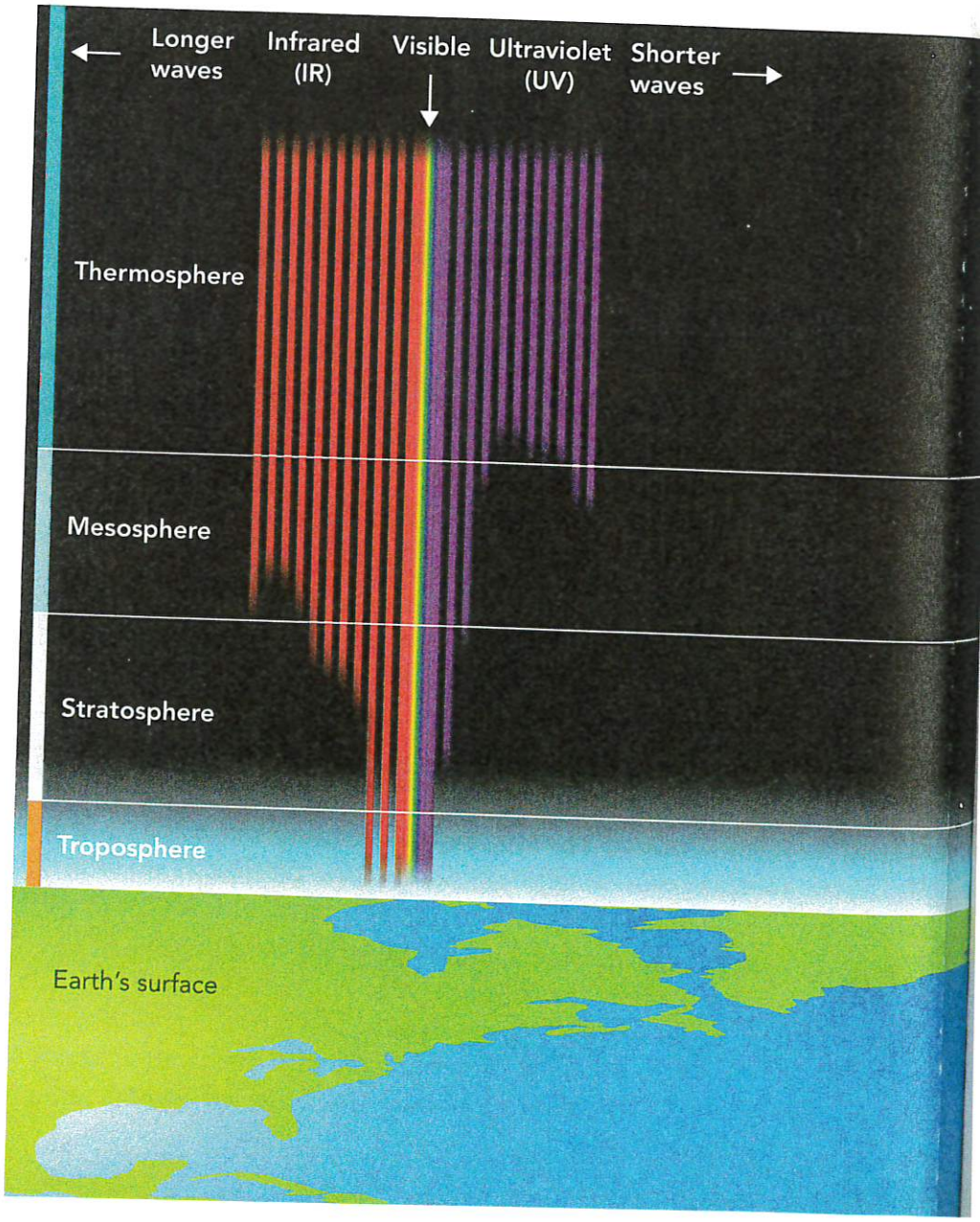
Sunlight must pass through the atmosphere before it reaches Earth's surface. The path of the sun's rays is shown in **Figure 2.** **Some sunlight is absorbed or reflected by the atmosphere before it can reach the surface. The rest passes through the atmosphere to the surface.**

Upper Atmosphere Different wavelengths of radiation are absorbed by different layers in the atmosphere. For example, some ultraviolet radiation is absorbed by the ozone layer in the stratosphere. Infrared radiation penetrates farther into the atmosphere before some of it is absorbed by water vapor and carbon dioxide.

FIGURE 2

Energy in the Atmosphere
Some wavelengths reach Earth's surface. Other wavelengths are completely or partially absorbed in the atmosphere.

Compare and Contrast
What happens to the radiation as it passes through Earth's atmosphere?



Troposphere Clouds act as mirrors, reflecting sunlight back into space. Dust-size particles and gases in the atmosphere disperse light in all directions, a process called **scattering.** When you look at the sky, the light you see has been scattered by gas molecules in the atmosphere. Gas molecules scatter short wavelengths of visible light (blue and violet) more than long wavelengths (red and orange). Scattered light looks bluer than ordinary sunlight. That's why the clear daytime sky looks blue.

Earth's Surface It may seem like a lot of the sun's energy is absorbed by gases in the atmosphere or reflected by clouds and particles. However, about 50 percent of the energy that reaches Earth's surface is absorbed by land and water and changed into heat. Look at **Figure 3** to see what happens to incoming sunlight at Earth's surface.

Ask Questions Before you read, preview the headings on these two pages. Ask a question you'd like to have answered. After you read, answer your question.

_____

_____

_____

_____

_____

_____

apply it!

The materials at Earth's surface shown below reflect different amounts of energy.

1 **Graph** Use the higher percentages below to draw a bar graph. Give it a title.

2 Based on your graph, which material reflects the most sunlight? Which absorbs the most?

_____

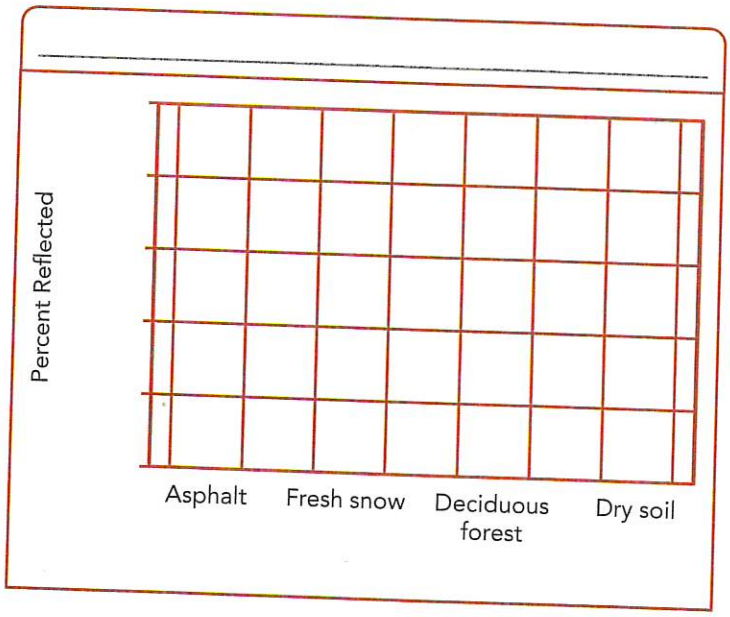
3 **CHALLENGE** Predict what might happen if a forested area was replaced with an asphalt parking lot.

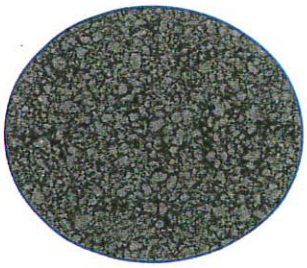
_____

_____

_____

_____





Asphalt
5–10% reflected

Fresh snow
80–90% reflected

Deciduous forest
15–20% reflected

Dry soil
20–25% reflected

FIGURE 3

Energy at Earth's Surface

Identify What's happening to energy in the lower atmosphere and at Earth's surface? Find out by using the words in the word bank below to complete each sentence.

Word Bank

reflected absorbed radiated

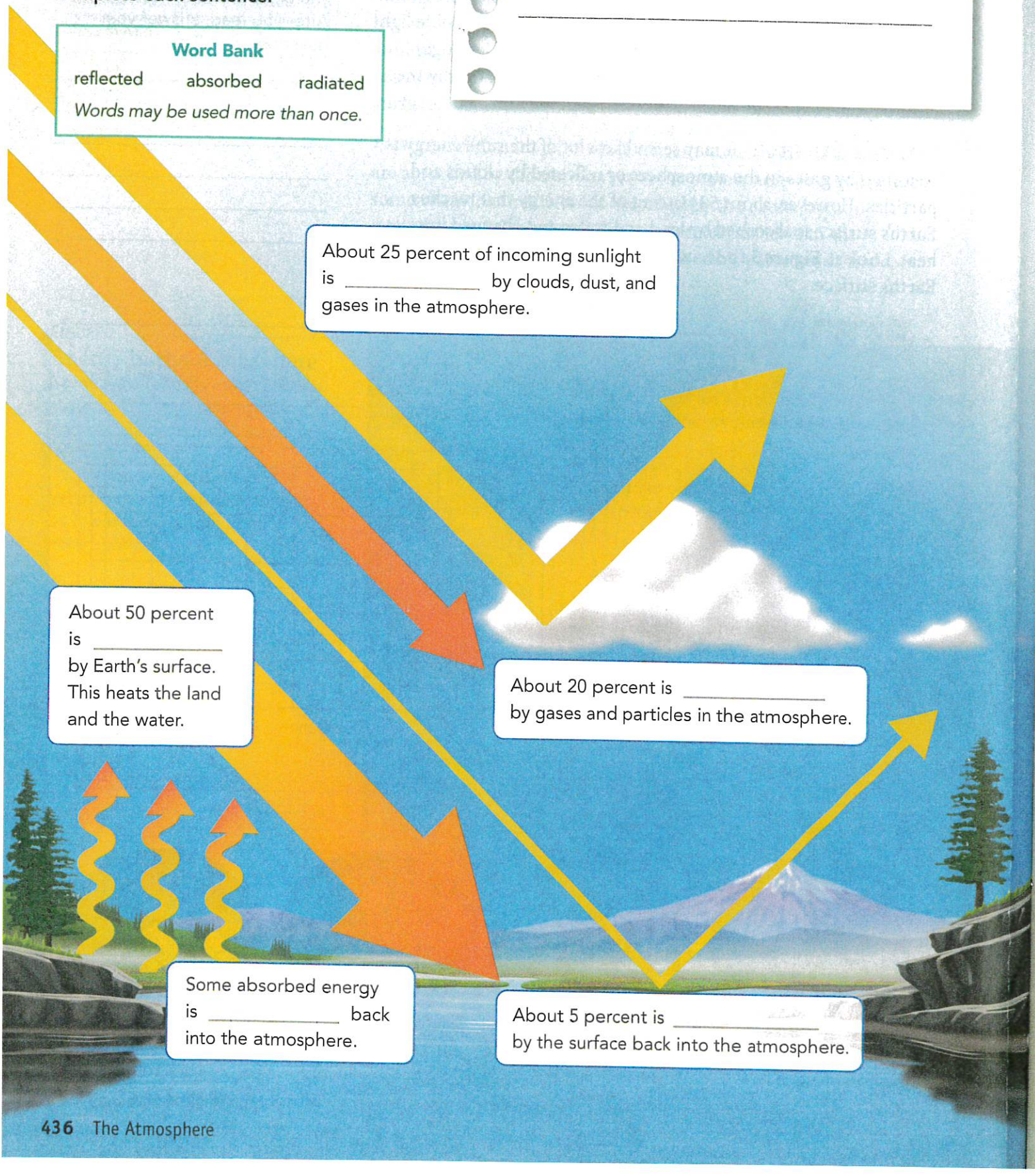
Words may be used more than once.

Draw Conclusions Using the diagram below, draw a conclusion about energy at Earth's surface.

_____

_____

_____



Earth's Energy Budget

What happens to the energy that heats the land and water? **Earth's surface radiates some energy back into the atmosphere as infrared radiation.** Much of this infrared radiation doesn't immediately travel all the way back into space. Instead, it's absorbed by water vapor, carbon dioxide, methane, and other gases in the air. The energy from the absorbed radiation heats the gases in the air. These gases in turn hold heat in Earth's atmosphere in a process called the **greenhouse effect.**

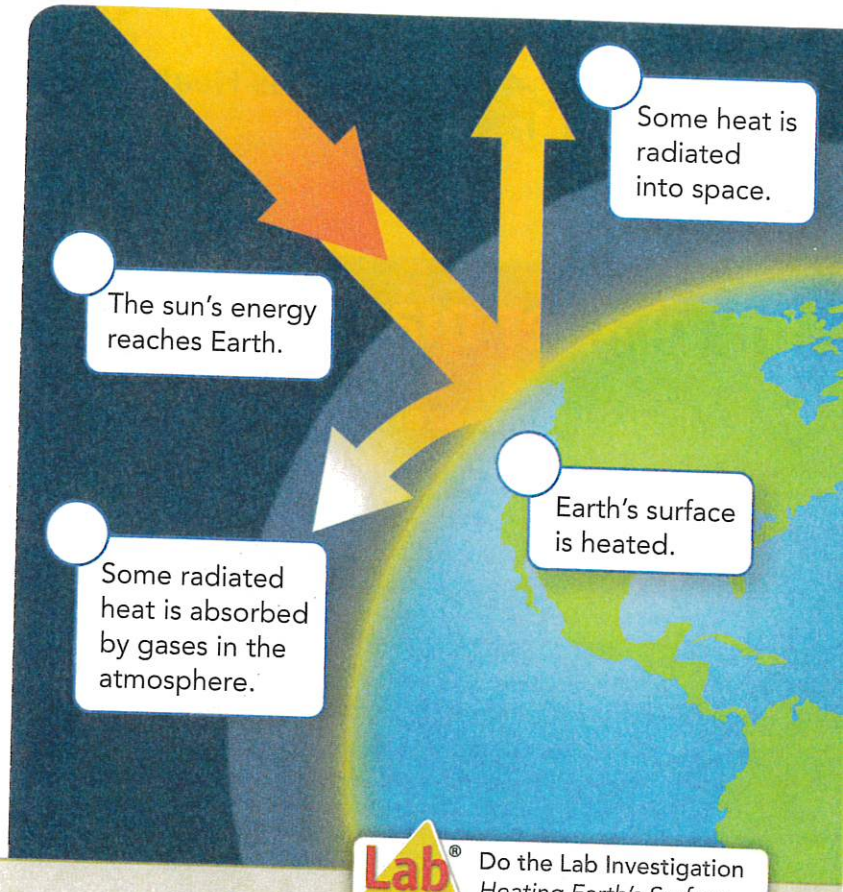
The greenhouse effect, shown in **Figure 4,** is a natural process. It keeps Earth's atmosphere at a temperature that is comfortable for most living things. Over time, the amount of energy absorbed by the atmosphere and Earth's surface is in balance with the amount of energy radiated into space. In this way, Earth's average temperatures remain fairly constant. But scientists have evidence that human activities may be altering this process.

FIGURE 4

ART IN MOTION **Greenhouse Effect**

The greenhouse effect is a natural heat-trapping process.

Sequence **Number each step in the diagram to show how the greenhouse effect takes place. Discuss the diagram with a partner.**



Lab zone® Do the Lab Investigation *Heating Earth's Surface.*

Assess Your Understanding

1a. Summarize What happens to most of the sunlight that reaches Earth?

GLE 27

b. Interpret Diagrams In **Figure 3,** what percentage of incoming sunlight is reflected by clouds, dust, and gases in the atmosphere?

GLE 27

c. Predict How might conditions on Earth be different without the greenhouse effect?

GLE 27

got it?

○ I get it! Now I know some energy

○ I need extra help with

Go to **my science coach** *online for help with this subject.*

GLE 27

Louisiana

LESSON 6

Winds

UNLOCK THE BIG ?

- What Causes Winds?
  GLE 27 (ESS-M-A12)
- How Do Local Winds and Global Winds Differ?
  GLE 27 (ESS-M-A12); 43, 44 (ESS-M-C6)

MY PLANET DIARY

EXTREME SPORTS

Windsurfing

Imagine being able to ride a wave at almost 81 km/h—not in a boat powered by a motor but on a board powered only by the wind. That's what windsurfing is all about.

Windsurfers stand on a sailboard, which is similar to a surfboard. But the sailboard has a mast and a sail that the surfer can control with his or her hands. It uses a sail to capture wind and move the surfer along the surface of the water. Jim Drake, one of the first inventors of windsurfing, points out:

"It's the simplicity of standing up so you can adjust your weight and move quickly, as well as actively participate in transmitting the sail's forces to the board."

Discuss these questions with a classmate. Write your answers below.

1. How does wind move the sail?

2. How have you experienced the effects of wind?

PLANET DIARY Go to **Planet Diary** to learn more about winds.

Lab zone® Do the Inquiry Warm-Up *Does the Wind Turn?*

Vocabulary

- wind
- anemometer
- windchill factor
- local winds
- sea breeze
- land breeze
- global winds
- Coriolis effect
- latitude

Skills

- Reading: Identify Supporting Evidence
- Inquiry: Draw Conclusions

What Causes Winds?

Grade 8 Grade Level Expectation

GLE 27 Identify different air masses, jet streams, global wind patterns, and other atmospheric phenomena and describe how they relate to weather events, such as El Niño and La Niña. (ESS-M-A12)

Air is a fluid, so it can move easily from place to place. But how does it do that? **Differences in air pressure cause the air to move.** Wind is the movement of air parallel to Earth's surface. Winds move from areas of high pressure to areas of lower pressure.

Most differences in air pressure are caused by the unequal heating of the atmosphere. Recall that convection currents form when an area of Earth's surface is heated by the sun's rays. Air over the heated surface expands and becomes less dense. As the air becomes less dense, its air pressure decreases. If a nearby area is not heated as much, the air above the less-heated area will be cooler and denser. The cool, dense air with a higher pressure flows underneath the warm, less dense air. This forces the warm air to rise.

FIGURE 1

Moving Air

Windsurfers need wind in order to move across the water. **Explain How do differences in air pressure cause wind?**

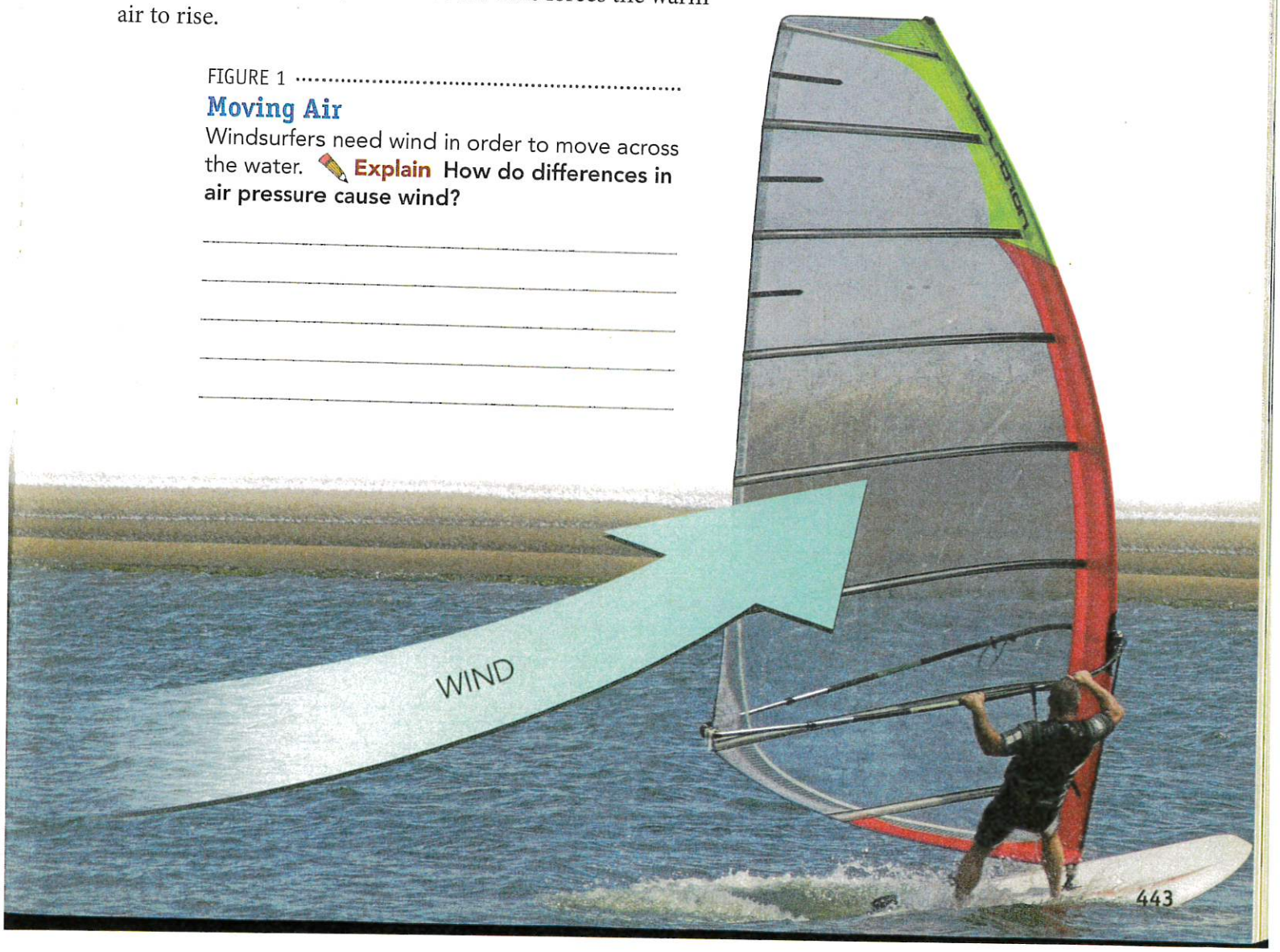
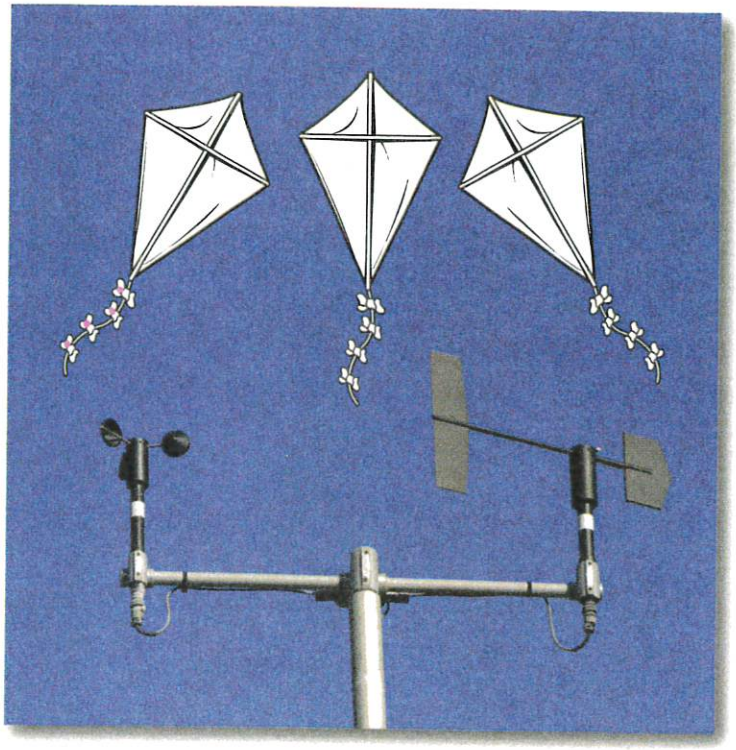


FIGURE 2

Wind Direction and Speed

Identify Based on the direction of the wind vane, which direction would your kite be flying? Indicate your answer by shading in your kite.



Measuring Wind

Winds are described by their direction and speed. Winds can blow from all directions: north, south, east, and west. Wind direction is determined with a wind vane. The wind swings the wind vane so that one end points into the wind. The name of a wind tells you where the wind is coming from. For example, a south wind blows from the south toward the north. A north wind blows to the south.

Wind speed can be measured with an **anemometer** (an uh MAHM uh tur). An anemometer has three or four cups mounted at the ends of spokes that spin on an axle. The force of the wind against the cups turns the axle. A meter connected to the axle shows the wind speed. **Figure 2** shows a wind vane and an anemometer.

Windchill Factor

On a warm day, a cool breeze can be refreshing. But during the winter, the same breeze can make you feel uncomfortably cold. The wind blowing over your skin removes body heat. The stronger the wind, the colder you feel. The increased cooling that a wind can cause is called the **windchill factor.** A weather report may say, "The temperature outside is 20 degrees Fahrenheit. But with a wind speed of 30 miles per hour, the windchill factor makes it feel like 1 degree above zero."

Lab zone® Do the Quick Lab *Build a Wind Vane.*

Assess Your Understanding

1a. Define What is wind?

GLE 27

b. Relate Cause and Effect How is wind related to air pressure and temperature?

GLE 27

got it?

○ I get it! Now I know that wind is _____

○ I need extra help with _____

Go to MY SCIENCE COACH *online for help with this subject.*

GLE 27

How Do Local Winds and Global Winds Differ?

Have you ever noticed a breeze at the beach on a hot summer day? Even if there is no wind inland, there may be a cool breeze blowing in from the water. This breeze is an example of a local wind.

Grade 8 Grade Level Expectations

GLE 27 Identify different air masses, jet streams, global wind patterns, and other atmospheric phenomena and describe how they relate to weather events, such as El Niño and La Niña. (ESS-M-A12)

GLE 43 Identify the processes involved in the creation of land and sea breezes. (ESS-M-C6)

GLE 44 Describe how unequal heating of Earth's surface affects movement of air masses and water in the atmosphere and hydrosphere. (ESS-M-C6)

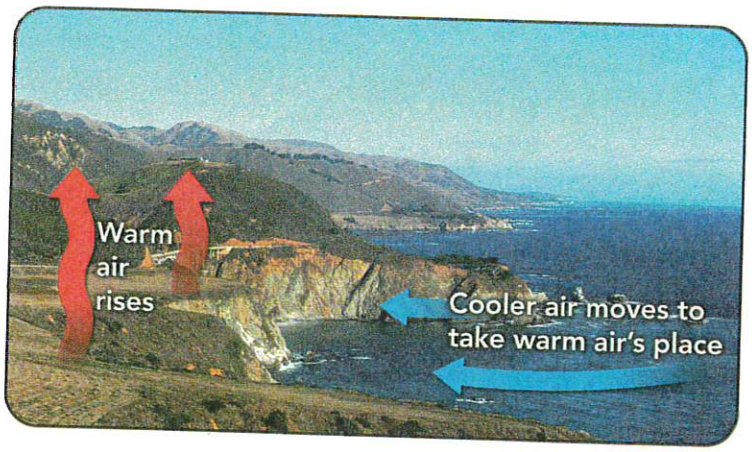
Local Winds

Winds that blow over short distances are called **local winds.** **The unequal heating of Earth's surface within a small area causes local winds.** These winds form only when large-scale winds are weak. Two types of local winds are sea breezes and land breezes, as shown in **Figure 3.**

FIGURE 3

Local Winds

Relate Text and Visuals Read about sea breezes. Add arrows to the bottom diagram to indicate how a land breeze develops. Then summarize the process.



Sea Breeze During the day, the land warms up faster than the water. The air over the land gets warmer than the air over the water. This warm air is less dense. It expands and rises, creating a low-pressure area. Cool air blows inland from over the water and moves underneath the warm air, causing a sea breeze. A **sea breeze** or a lake breeze is a local wind that blows from an ocean or lake.

Land Breeze At night, the process is reversed. The flow of air from land to a body of water forms a **land breeze.**

Global Winds

Global winds are winds that blow steadily from specific directions over long distances. **Like local winds, global winds are created by the unequal heating of Earth's surface. But unlike local winds, global winds occur over a large area.** In **Figure 4,** you can see how the sun's radiation strikes Earth. In the middle of the day near the equator, the sun is almost directly overhead. The direct rays from the sun heat Earth's surface intensely. Near the poles, the sun's rays strike Earth's surface at a lower angle. The sun's energy is spread out over a larger area, so it heats the surface less. As a result, temperatures near the poles are much lower than they are near the equator.

Global Convection Currents

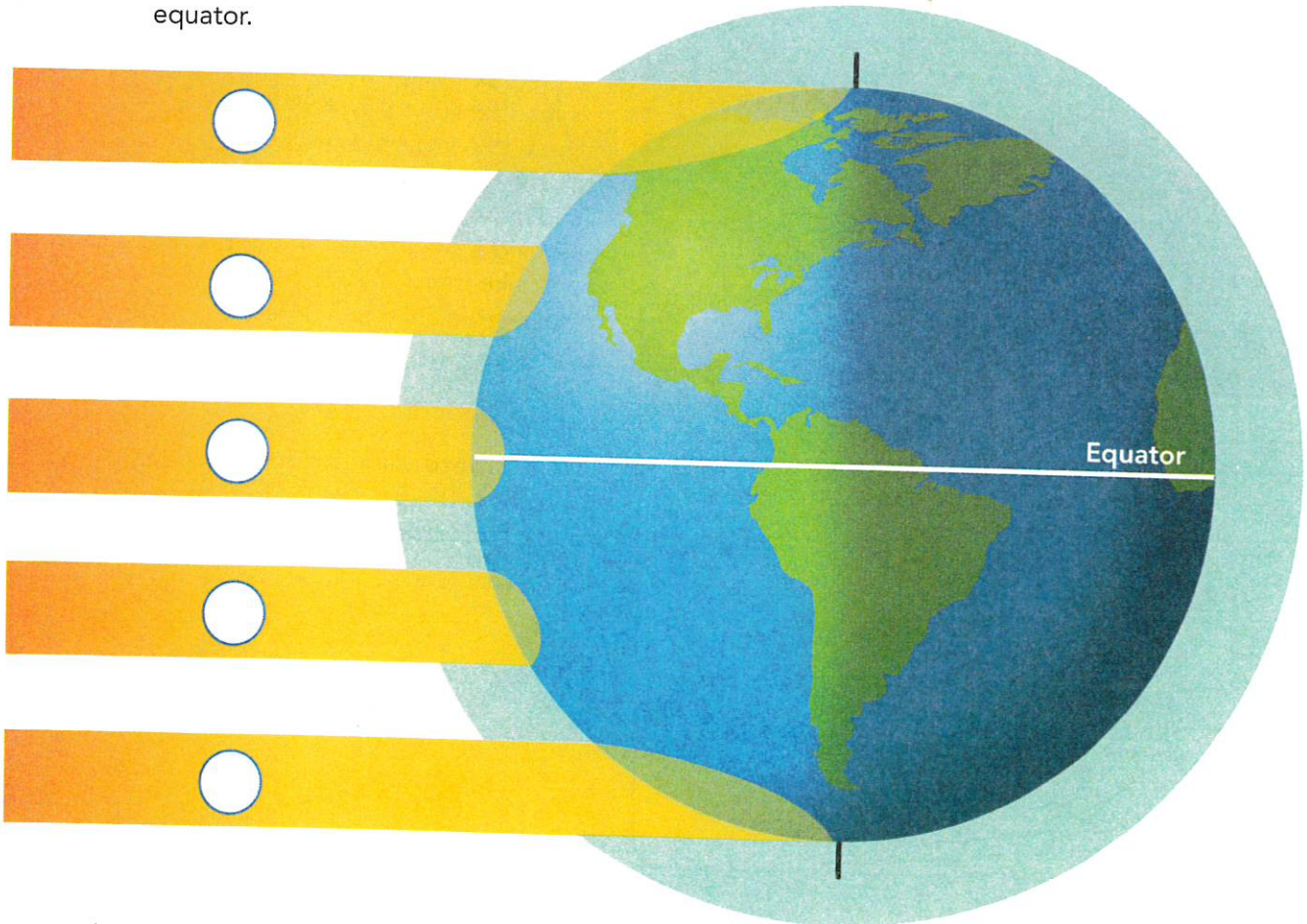
How do global winds develop? Temperature differences between the equator and the poles produce giant convection currents in the atmosphere. Warm air rises at the equator, and cold air sinks at the poles. Therefore air pressure tends to be lower near the equator and greater near the poles. This difference in pressure causes winds at Earth's surface to blow from the poles toward the equator. Higher in the atmosphere, however, air flows away from the equator toward the poles. Those air movements produce global winds.

FIGURE 4

Heating of Earth's Surface

Interpret Diagrams **The angle of the sun's rays causes temperature differences at Earth's surface.**

1. Label the areas where the sun hits Earth most directly (M) and least directly (L).
2. CHALLENGE Draw a convection current in the atmosphere north of the equator.



The Coriolis Effect If Earth did not rotate, global winds would blow in a straight line from the poles toward the equator. Because Earth is rotating, however, global winds do not follow a straight path. As the winds blow, Earth rotates from west to east underneath them, making it seem as if the winds have curved. The way Earth's rotation makes winds curve is called the **Coriolis effect** (kawr ee OH lis). Because of the Coriolis effect, global winds in the Northern Hemisphere gradually turn toward the right. A wind blowing toward the south gradually turns toward the southwest. In the Southern Hemisphere, winds curve toward the left.

Identify Supporting Evidence Underline the text that describes how winds blow due to the Coriolis effect.

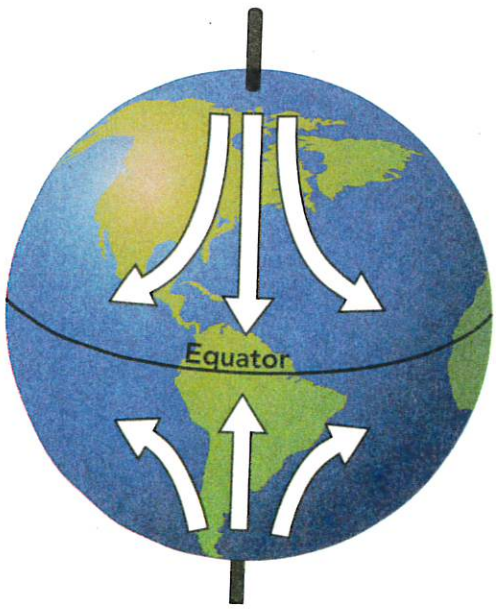
apply it!

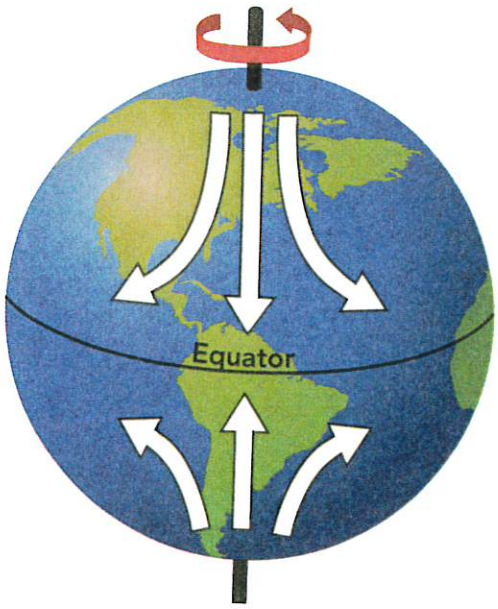
The Coriolis effect determines the direction of global winds.

1. Look at the globe on the left. Shade in the arrows that show the direction the global winds would blow without the Coriolis effect.

2. Look at the globe on the right. Shade in the arrows that show the direction the global winds blow as a result of the Coriolis effect.

3. **Draw Conclusions** Based on your last answer, what direction do global winds blow in the Northern Hemisphere? In the Southern Hemisphere?





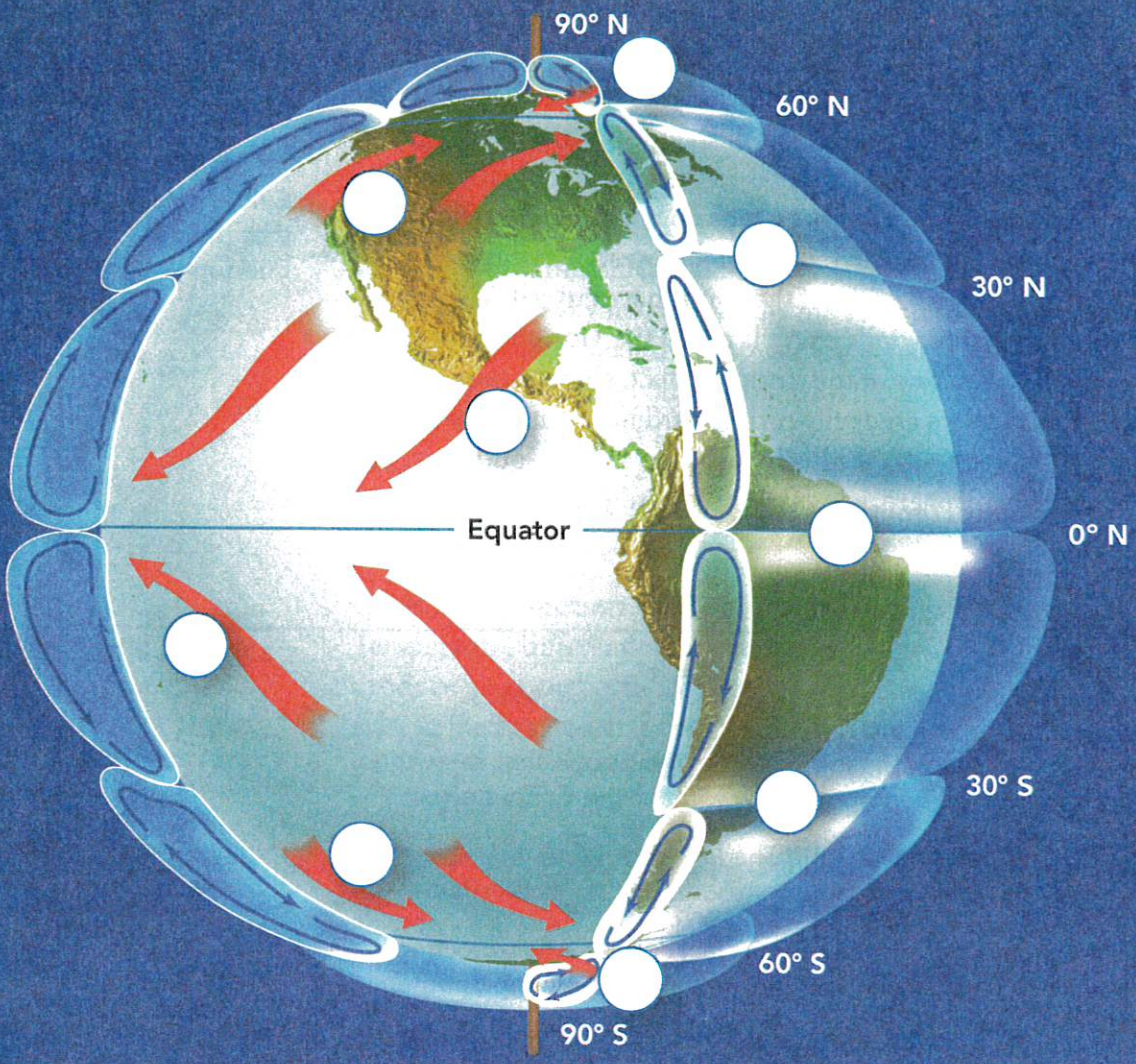


FIGURE 5

INTERACTIVE ART

Global Wind Belts

The Coriolis effect and other factors combine to produce a pattern of wind belts and calm areas around Earth.

Relate Text and Visuals
Match the descriptions of the global winds with their location on the globe.

A **Doldrums** are a calm area where warm air rises. They occur at the equator where the sun heats the surface strongly. Warm air rises steadily, creating an area of low pressure. Cool air moves into the area, but is warmed rapidly and rises before it moves very far.

B **Horse Latitudes** are two calm areas of sinking air. **Latitude** is the distance from the equator, measured in degrees. At about 30° north and south latitudes, the air stops moving toward the poles and sinks.

C **Trade Winds** blow from the horse latitudes toward the equator. As cold air over the horse latitudes sinks, it forms a region of high pressure. This causes surface winds to blow. The winds that blow toward the equator are turned west by the Coriolis effect.

D **Prevailing Westerlies** blow from west to east, away from the horse latitudes. In the mid-latitudes, between 30° and 60° north and south, winds that blow toward the poles are turned toward the east by the Coriolis effect.

E **Polar Easterlies** blow cold air away from the poles. Air near the poles sinks and flows back toward lower latitudes. The Coriolis effect shifts these polar winds to the west, producing the polar easterlies.

ASSIGNMENTS

Day 6 Assignment

Name: _____

KEY IDEAS

- The sun drives all weather patterns on Earth
- Energy from the sun is transferred to water and land at different rates.
- Water heats and cools at a slower rate than the land, as water absorbs and stores large amounts of energy from the sun and release it very slowly
    - This causes patterns in climates as land near the ocean experiences more mild temperatures than land further from the ocean.
- Sunlight energy propels oceanic and atmospheric circulation
    - Ocean currents are created by changes in temperature and salinity.
    - As water heats, it becomes less dense, and rises. This causes cooler, more dense water to sink.
    - Water that has a greater salinity, or salt content, is more dense and also sinks.
    - As warm currents pass a land mass, that region experiences warmer temperatures, the opposite is true for cooler currents

Define the Following Terms:

Current:

_____

_____

Coriolis Effect:

_____

_____

Questions to Answer

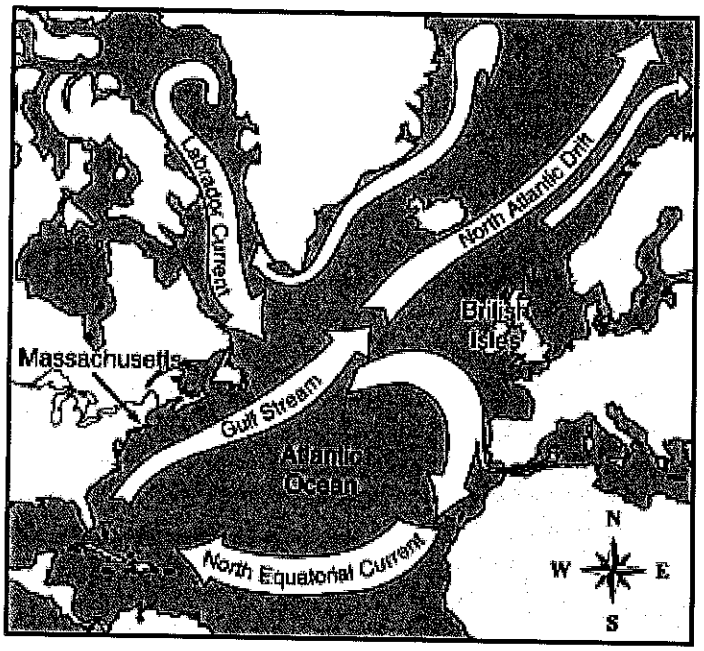
1. How are surface currents and deep ocean currents different? Explain what causes each in your answer.

2. How do ocean currents affect climate? Explain the role of the global ocean conveyor in your answer.

3. Why do Coastal regions have different climates than

EXIT TICKET

The map below shows Atlantic Ocean currents.



1. Which of the currents *most* affects the climate of Massachusetts and its surrounding states?

A. Gulf Stream
B. Labrador Current
C. North Atlantic Drift
D. North Equatorial Current

The table below shows the average summer temperature increases for regions in Canada.

Average Summer Temperature for Regions in Canada (1948–2004)

Region in Canada	Temperature Increase (°C)
Atlantic coast	0.46
Pacific coast	0.67
northeastern forest	0.29
northwestern forest	0.57
southern mountains	0.71
northern mountains	0.86

Part A

2. Which trend can be correctly inferred from the data?

A. The mountain regions are warming more than the coasts.
B. The forest regions are warming more than the mountain regions.
C. The Atlantic coast is warming more than the Pacific coast.
D. The northeastern forest is warming more than the northwestern forest.

Part B

3. Explain why the trend identified in Part A is observed.

Day 7 Assignment

Name: _____

KEY IDEAS

- The sun's energy heats Earth's surface, which in turn heats the atmosphere (the air above it)
- The atmosphere is made of particles and gas
- As solar radiation, or light energy hits the surface of the Earth, some of it is reflected back into space, but some of it reaches Earth's surface and transfers to heat energy.
- Greenhouse gasses slow down the release of this heat energy from the surface of Earth as they trap the heat energy in the atmosphere.
    - The greenhouse gases (Ch_4, CO_2, H_2O (vapor), and N_2O)
    - Without greenhouse gasses, earth would be too cold for life. If Earth has too much greenhouse gasses, it would be too hot.

Define the Following Terms:

Atmosphere:

_____

_____

Greenhouse Effect:

_____

_____

Greenhouse Gases:

_____

_____

Day 7 Assignment

Questions to Answer:

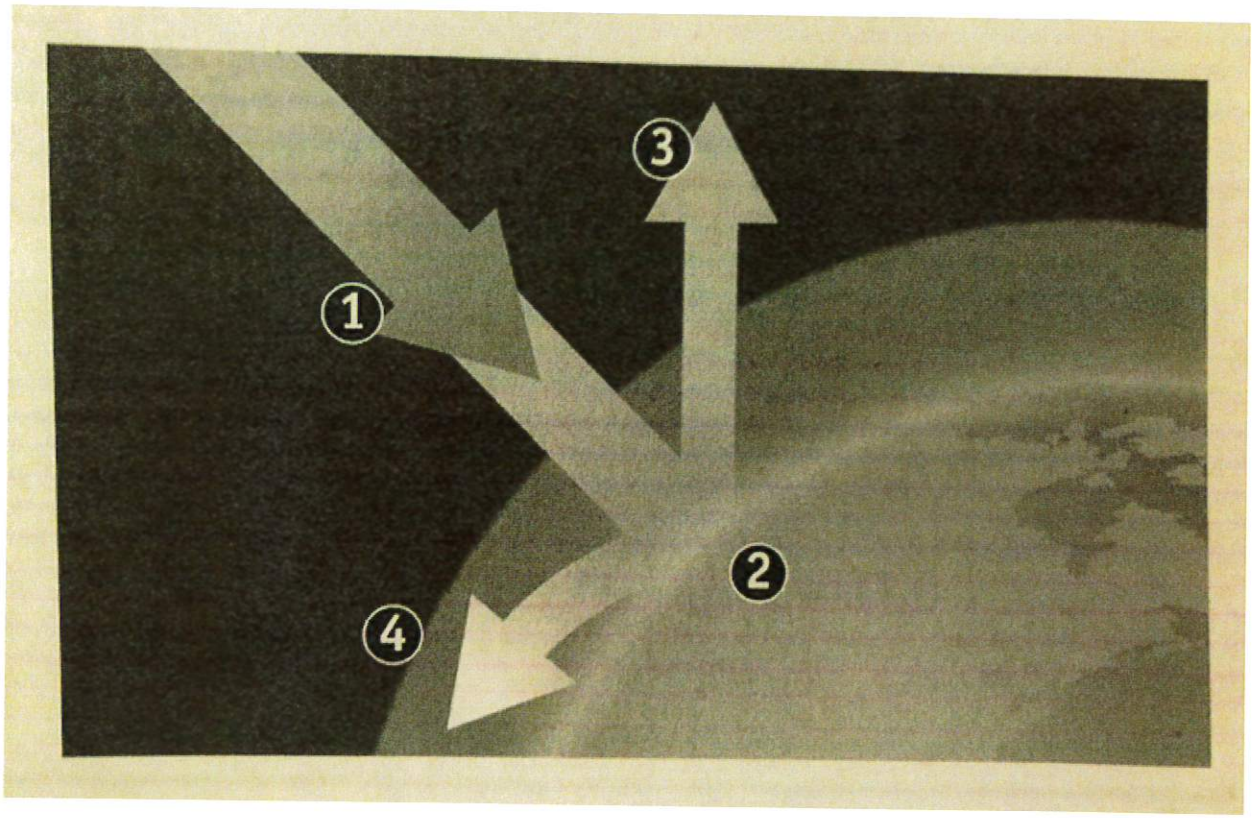
1. What components make up the atmosphere?

2. What happens to most of the sunlight that reaches Earth?

3. How does most of the energy from the sun travel to Earth's surface?

Day 7 Assignment

Use the diagram to answer question 4



4. Describe the process that results in the greenhouse effect. How does it affect Earth's atmosphere?

EXIT TICKET

1. Which gases are common greenhouse gases?

Select the **three** best answers

A. Carbon Dioxide (CO_2) gas
B. Helium (He_2) gas
C. Methane (CH_4) gas
D. Nitrogen (N_2) gas
E. Oxygen (O_2) gas
F. Water Vapor (H_2O)

2. How would earth be different without greenhouse gases? Explain your answer by explaining the relationship between the atmosphere and the sun's energy.

Day 8 Assignment

Name: _____

KEY IDEAS

- The sun heats the Earth unequally
- - Warmer air is less dense and rises creating less pressure
- -Cooler air is more dense and falls, creating more pressure.
- -Denser air with more pressure moves towards areas of lower pressure.
- -The wind can move clouds throughout the atmosphere, bringing precipitation to a new location.

Define the Following Terms:

Coriolis Effect: _____

_____

Local Winds:

_____

_____

Global Winds:

_____

_____

Wind: _____

_____

Questions to Answer:

1. How do differences in air pressure cause wind?

2. How does the movement of hot air at the equator and cold air at the poles produce global wind patterns?

3. Which causes land and sea breezes?

- **A.** Temperature difference between the equator and the poles?
- **B.** The unequal heating of Earth's surface
- **C.** Equal areas of pressure
- **D.** The increased windchill factor on a cold day

Use the diagram to answer question 4

Barometric Pressure (millibars)

City	Friday	Saturday	Sunday
Baton Rouge, Louisiana	1005	1011	1006
Houston, Texas	1006	1008	1002

4. The data table shows the barometric air pressure readings for two cities. In which direction would you expect winds to move on each day? Explain your answer.

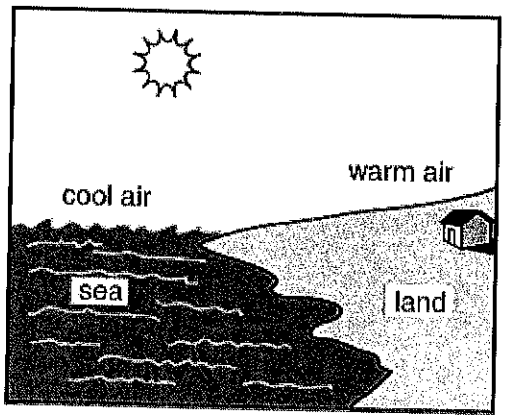
EXIT TICKET

1. The main source of energy for wind currents on Earth is
   - **A.** Lightning
   - **B.** Heat from the Sun
   - **C.** The moon's gravity
   - **D.** Heat from Earth's interior

2. Which best explains how the Coriolis effect influences weather conditions?
   - **A.** It causes winds to rotate, forming tornadoes on Earth
   - **B.** It causes winds to move from East to West (left to right) in the Southern Hemisphere
   - **C.** It causes winds to move from East to West (left to right)
   - **D.** It causes winds to follow a straight-line path around Earth

3. Air moving from the poles toward the equator turns west. The primary cause of this global deflection is
   - **A.** The shape and size of land masses
   - **B.** Larger cities surrounded by farmlands
   - **C.** Changes in the magnetic field
   - **D.** The rotation of the planet

The picture below shows a place where air currents will form due to the uneven heating of Earth.



4. In which direction will air currents *most likely* move?
   - **A.** Straight down over the land
   - **B.** From the land toward the sea
   - **C.** Straight up above the sea
   - **D.** From the sea toward the land