FIRSTLINE SCHOOLS
EDUCATION FOR LIFE

# DISTANCE LEARNING FOR FIRSTLINE STUDENTS

# PACKET #2

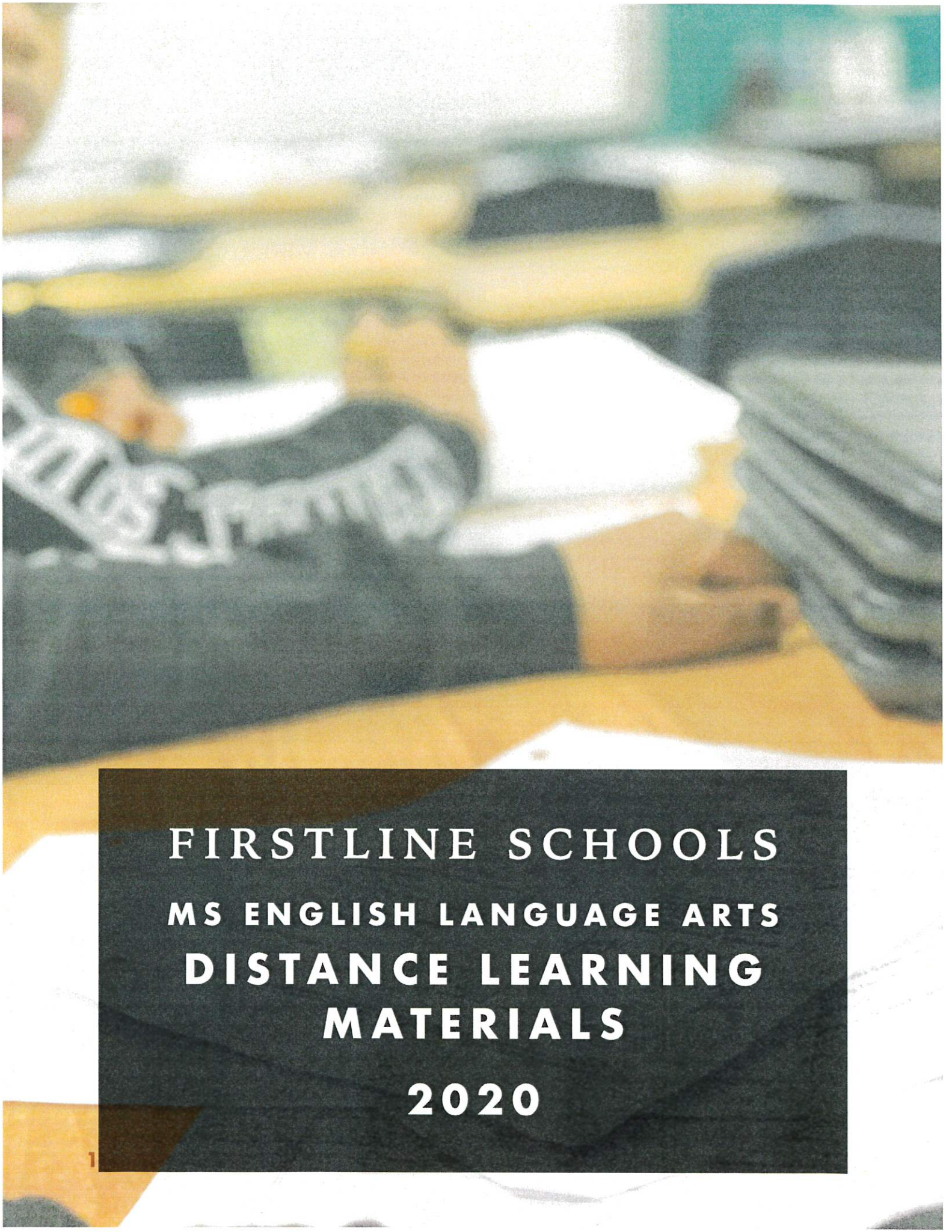
Start Date: Monday, March 30, 2020

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*

**OLIVER TWIST**

**Today you will analyze a passage from *Oliver Twist* and a passage from *A Portrait of the Artist as a Young Man*. As you read these texts, you will gather information and answer questions about the effect of dialogue or events so you can write an essay.**

Read the passage from *Oliver Twist*. Then answer the questions.

## from *Oliver Twist*

*by* Charles Dickens

1 The room in which the boys were fed, was a large stone hall, with a copper at one end: out of which the master, dressed in an apron for the purpose, and assisted by one or two women, ladled the gruel at meal-times. Of this festive composition each boy had one porringer, and no more—except on occasions of great public rejoicing, when he had two ounces and a quarter of bread besides. The bowls never wanted washing. The boys polished them with their spoons till they shone again; and when they had performed this operation (which never took very long, the spoons being nearly as large as the bowls), they would sit staring at the copper, with such eager eyes, as if they could have devoured the very bricks of which it was composed, employing themselves, meanwhile, in sucking their fingers most assiduously, with the view of catching up any stray splashes of gruel that might have been cast thereon. Boys have generally excellent appetites. Oliver Twist and his companions suffered the tortures of slow starvation for three months: at last they got so voracious and wild with hunger, that one boy, who was tall for his age, and hadn't been used to that sort of thing (for his father had kept a small cookshop), hinted darkly to his companions, that unless he had another basin of gruel per diem, he was afraid he might some night happen to eat the boy who slept next to him, who happened to be a weakly youth of tender age. He had a wild hungry eye; and they implicitly believed him. A council was held; lots were cast who should walk up to the master after supper that evening, and ask for more; and it fell to Oliver Twist.

2 The evening arrived; the boys took their places. The master, in his cook's uniform, stationed himself at the copper; his pauper assistants ranged themselves behind him; the gruel was served out; and a long grace was said over the short commons. The gruel disappeared; the boys whispered to each other, and winked at Oliver; while his next neighbours nudged him. Child as he was, he was desperate with hunger, and reckless with misery. He rose from the table, and advancing to the master, basin and spoon in hand, said: somewhat alarmed at his own temerity:

3 "Please, sir, I want some more."

4 The master was a fat, healthy man; but he turned very pale. He gazed in stupefied astonishment on the small rebel for some seconds, and then clung for support to the copper. The assistants were paralysed with wonder; the boys with fear.

5 "What!" said the master at length, in a faint voice.

6 "Please, sir," replied Oliver, "I want some more."

7 The master aimed a blow at Oliver's head with the ladle; pinioned him in his arms; and shrieked aloud for the beadle.

8 The board were sitting in solemn conclave, when Mr. Bumble rushed into the room in great excitement, and addressing the gentleman in the high chair, said,

9 "Mr. Limbkins, I beg your pardon, sir! Oliver Twist has asked for more!"

10 There was a general start. Horror was depicted on every countenance.

11 "For more!" said Mr. Limbkins. "Compose yourself, Bumble, and answer me distinctly. Do I understand that he asked for more, after he had eaten the supper allotted by the dietary?"

12 "He did, sir," replied Bumble.

13 "That boy will be hung," said the gentleman in the white waistcoat. "I know that boy will be hung."

14 Nobody controverted the prophetic gentleman's opinion. An animated discussion took place. Oliver was ordered into instant confinement, and a bill was next morning pasted on the outside of the gate, offering a reward of five pounds to anybody who would take Oliver Twist off the hands of the parish. In other words, five pounds and Oliver Twist were offered to any man or woman who wanted an apprentice to any trade, business, or calling.

15 "I never was more convinced of anything in my life," said the gentleman in the white waistcoat, as he knocked at the gate and read the bill next morning: "I never was more convinced of anything in my life, than I am that boy will come to be hung."

16 As I purpose to show in the sequel whether the white-waist-coated gentleman was right or not, I should perhaps mar the interest of this narrative (supposing it to possess any at all), if I ventured to hint just yet, whether the life of Oliver Twist had this violent termination or no.

From OLIVER TWIST, CHAPTER II: TREATS OF OLIVER TWIST'S GROWTH, EDUCATION, AND BOARD—Public Domain



GO ON ▶

1 **Part A**

How does the word **festive** in paragraph 1 affect the meaning of the paragraph?

Ⓐ by adding sarcasm to show the poor quality of the meal being served

Ⓑ by creating imagery of the elaborate meal that is about to be served

Ⓒ by providing a description of a special celebration

Ⓓ by comparing an elaborate holiday meal with a typical meal

2 **Part B**

Which phrase from paragraph 1 supports the answer to Part A?

Ⓐ "The room in which the boys were fed, was a large stone hall. . . ."

Ⓑ ". . . the master, dressed in an apron for the purpose, and assisted by one or two women . . ."

Ⓒ ". . . each boy had one porringer, and no more. . . ."

Ⓓ ". . . except on occasions of great public rejoicing . . ."



GO ON ▶

3 **Part A**

In paragraph 1, why does the author describe the boy who **was afraid he might some night happen to eat the boy who slept next to him**?

Ⓐ to show how the adults in charge at the institution treated the boys

Ⓑ to provide details that develop a major character in the passage

Ⓒ to illustrate how the boys are affected by the conditions at the institution

Ⓓ to offer an example of the way the boys govern themselves in the passage

4 **Part B**

Which **two** phrases offer additional support for the answer to Part A?

Ⓐ "... suffered the tortures of slow starvation . . ." (paragraph 1)

Ⓑ ". . . one boy, who was tall for his age, and hadn't been used to that sort of thing . . ." (paragraph 1)

Ⓒ "A council was held; lots were cast. . . ." (paragraph 1)

Ⓓ "The master, in his cook's uniform, stationed himself at the copper. . . ." (paragraph 2)

Ⓔ ". . . he was desperate with hunger, and reckless with misery." (paragraph 2)

Ⓕ "The assistants were paralysed with wonder. . . ." (paragraph 4)



GO ON ▶

5. **Part A**

How do the other boys provoke Oliver Twist's decision to ask for an extra bowl of gruel?

Ⓐ They hint that a weaker boy might be hurt while he is sleeping during the night.

Ⓑ They discourage him from asking and act surprised by his sudden decision.

Ⓒ They trick him into asking for more by winking and smiling at him.

Ⓓ They develop a plan, and he is chosen to carry it out.

6. **Part B**

Which quotation from the passage from *Oliver Twist* supports the answer to Part A?

Ⓐ ". . . they would sit staring at the copper, with such eager eyes, as if they could have devoured the very bricks of which it was composed. . . ." (paragraph 1)

Ⓑ "A council was held; lots were cast. . . ." (paragraph 1)

Ⓒ ". . . his pauper assistants ranged themselves behind him; the gruel was served out. . . ." (paragraph 2)

Ⓓ "He rose from the table . . . somewhat alarmed at his own temerity . . ." (paragraph 2)

# A PORTRAIT OF THE ARTIST AS A YOUNG MAN

Read the passage from *A Portrait of the Artist as a Young Man*. Then answer the questions.

# from *A Portrait of the Artist as a Young Man*

*by* James Joyce

1 The bell rang and then the classes began to file out of the rooms and along the corridors towards the refectory. He sat looking at the two prints of butter on his plate but could not eat the damp bread. The tablecloth was damp and limp. But he drank off the hot weak tea which the clumsy scullion, girt with a white apron, poured into his cup. He wondered whether the scullion's apron was damp too or whether all white things were cold and damp. Nasty Roche and Saunn drank cocoa that their people sent them in tins. They said they could not drink the tea; that it was hogwash. Their fathers were magistrates, the fellows said.

2 All the boys seemed to him very strange. They had all fathers and mothers and different clothes and voices. He longed to be at home and lay his head on his mother's lap. But he could not: and so he longed for the play and study and prayers to be over and to be in bed.

3 He drank another cup of hot tea and Fleming said:

4 —What's up? Have you a pain or what's up with you?

5 —I don't know, Stephen said.

6 —Sick in your breadbasket, Fleming said, because your face looks white. It will go away.

7 —Oh yes, Stephen said.

8 But he was not sick there. He thought that he was sick in his heart if you could be sick in that place. Fleming was very decent to ask him. He wanted to cry. He leaned his elbows on the table and shut and opened the flaps of his ears. Then he heard the noise of the refectory every time he opened the flaps of his ears. It made a roar like a train at night. And when he closed the flaps the roar was shut off like a train going into a tunnel. That night at Dalkey the train had roared like that and then, when it went into the tunnel, the roar stopped. He closed his eyes and the train went on, roaring and then stopping; roaring again, stopping. It was nice to hear it roar and stop and then roar out of the tunnel again and then stop.

9 Then the higher line fellows began to come down along the matting in the middle of the refectory, Paddy Rath and Jimmy Magee and the Spaniard who was allowed to smoke cigars and the little Portuguese who wore the woolly cap. And then the lower line tables and the tables of the third line. And every single fellow had a different way of walking.

10 He sat in a corner of the playroom pretending to watch a game of dominoes and once or twice he was able to hear for an instant the little song of the gas. The prefect was at the door with some boys and Simon Moonan was knotting his false sleeves. He was telling them something about Tullabeg.



GO ON ▶

11 Then he went away from the door and Wells came over to Stephen and said:

12 —Tell us, Dedalus, do you kiss your mother before you go to bed?

13 Stephen answered:

14 —I do.

15 Wells turned to the other fellows and said:

16 —O, I say, here's a fellow says he kisses his mother every night before he goes to bed.

17 The other fellows stopped their game and turned round, laughing. Stephen blushed under their eyes and said:

18 —I do not.

19 —O, I say, here's a fellow says he doesn't kiss his mother before he goes to bed.

20 They all laughed again. Stephen tried to laugh with them. He felt his whole body hot and confused in a moment. What was the right answer to the question? He had given two and still Wells laughed. But Wells must know the right answer for he was in third of grammar.

From A PORTRAIT OF THE ARTIST AS A YOUNG MAN by James Joyce—Public Domain



GO ON ▶

1 **Part A**

In the passage from *A Portrait of the Artist as a Young Man*, the narrator says that Stephen thought **he was sick in his heart**. How does the phrase **sick in his heart** impact the reader's understanding of Stephen's character?

Ⓐ Stephen has a heart condition that makes him tired and weak.

Ⓑ Stephen is sick of being around the other boys because they tease him about his mother.

Ⓒ Stephen's desire to be at home with his mother is so strong that he is extremely sad and lonely.

Ⓓ Stephen is sick to his stomach because the food in the refectory is of such poor quality.

2 **Part B**

How does the phrase **sick in his heart** contribute to the tone of the entire passage?

Ⓐ by creating conflict between Stephen and the other boys to support a tense tone

Ⓑ by adding detail to Stephen's character to support a melancholy tone

Ⓒ by illustrating Stephen's inner thoughts to support a serious tone

Ⓓ by describing characters who are suspicious of each other to support an angry tone



GO ON ▶

3 **Part A**

What can the reader infer about Stephen from his conversation with the other boys?

Ⓐ Stephen is accepted easily by his peers.
Ⓑ Stephen is not willing to compromise with his peers.
Ⓒ Stephen is not confident when interacting with his peers.
Ⓓ Stephen is frightened of his peers.

4 **Part B**

Which **two** elements of the passage **best** provide support for the answer to Part A?

Ⓐ the other boys' thoughts
Ⓑ Stephen's thoughts
Ⓒ the other boys' appearances
Ⓓ Stephen's appearance
Ⓔ the other boys' comments
Ⓕ Stephen's comments



GO ON ▶

Both Charles Dickens and James Joyce incorporate dialogue into their passages.

Use evidence you have gathered from **both** passages to write an essay analyzing how the dialogue in **each** passage functions to reveal aspects of the characters. You should discuss **more than one** character from **each** passage.



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

# THE INCREDIBLE TALKING MACHINE

**Today you will research the topic of sound and the invention of the phonograph. You will read the article "The Incredible Talking Machine." Then you will read a passage from the article "History of the Cylinder Phonograph" and the article "Psst . . . Hey, You." As you review these sources, you will gather information and answer questions about sound and the invention of the phonograph so you can write an essay.**

# The Incredible Talking Machine

*by* Randall Stross

1 In the end, they named it the phonograph. But it might have been called the omphlegraph, meaning "voice writer." Or the antiphone (back talker). Or the didasko phone (portable teacher). These are some of the names someone wrote in a logbook in Thomas Edison's laboratory in 1877, after Edison and his assistants invented the first rudimentary machine for recording and playing back sounds. From the first, they thought it would be used to reproduce the human voice, but they had no clear idea of its exact purpose.

2 Edison once said, "Anything that won't sell, I don't want to invent." But all his life, he was a better inventor than salesman. The phonograph, his first invention to make him world-famous, is a perfect example. It was the product of a well-prepared but wandering mind.

3 It was also the outcome of an amazing burst of inventiveness. One evening in July 1877, while relaxing with his assistants after their regular midnight dinner, Edison had an idea. They were working with ways to use paper strips to make a record of telegraph messages. Why not adapt those to record the vibrations of the diaphragm in a telephone mouthpiece? Thinking out loud, Edison suggested attaching a needle to the back of the diaphragm and mounting it above rollers for the paper strips. Speaking into the mouthpiece would cause the diaphragm to move, which in turn would cause the needle to inscribe squiggled indentations into the strips. If the paper were then pulled through the rollers again with the needle resting in the groove, the indentations would move the attached diaphragm, which should reproduce the original sound.

4 Edison's assistants set to work. Within the hour, they had a working device they tried out by reciting "Mary had a little lamb" into the telephone. In the first trial, all that could be heard from the playback was "ary ad ell am." But that was encouraging. The staff went on working through the night, fiddling with the gizmo—and thus occurred the first midnight recording session.

5 Edison and his crew later replaced the paper and rollers with tinfoil, which was wrapped around a cylinder attached to a crank. But Edison did not regard the machine as commercially promising. At best, he thought, it might be an office machine allowing businessmen to dictate letters.

6 When word of the invention spread, however, the outside world saw greater possibilities. The dead could speak to us, eternally! Collectors could keep what the *New York Times* called a "well-stocked oratorical cellar." But the primitive phonograph that Edison demonstrated for the editors of *Scientific American* that December remained exceedingly limited. It could clearly introduce itself—"How do you do? How do you like the phonograph?"—but that exhausted its recording capacity.



GO ON ▶

7 Still, the editors were excited enough to publish an admiring bulletin about the device—a first shot that set off an avalanche of publicity. A reporter wrote him, "I want to know you right bad," and everyone else did too. Investors enlisted him in a new venture, the Edison Speaking Phonograph Co. But he soon lost interest in making the phonograph a salable product. The company introduced a toy model that functioned badly and a second, more expensive one that was used by show-business entrepreneurs who rented concert halls to demonstrate the wondrous machine to paying audiences. It broke down frequently and required a trained technician's constant attention.

8 Ten years elapsed before Edison returned to the phonograph, only after a competitor developed a wax-coated cylinder that could be removed without ruining the recording, something impossible to do with Edison's delicate tinfoil. To him, the idea that his most cherished invention faced competition was unendurable. He set to work on what he would call the Perfected Phonograph. When he introduced it to the market, however, in 1889, it was anything but perfect as the dictation device he still thought it to be. But it played music beautifully. Edison's backers tried to persuade him that the phonograph could be marketed for entertainment purposes, but he could not let go of his conviction that it was destined for the office.

9 Competitors leaped further ahead, developing a new recording medium, the disc, and rushing to sign musical artists to recording contracts. Eventually, Edison capitulated and entered the recorded-music business too—a business he was poorly suited to as a man who disapproved of most genres of popular music. He dismissed "miserable dance and ragtime selections" and described jazz as something for "the nuts." Another competitor soon emerged, the Victor Talking Machine Co. and its Victrola. And while Victor built a stable of notable musical artists, Edison remained unwilling to pay royalty advances necessary to recruit stars.

10 In the 1920s, Edison's phonograph faced a new challenge, commercial radio. The other phonograph companies introduced radios but Edison refused, wanting nothing to do with the medium's inferior sound quality. Prodded by his sons, he grudgingly relented, but the move came too late—in the midst of the stock-market crash of 1929. Within a year, his radio company ceased production. Edison died a year later. The music industry he had set in motion lived on, evolving into stereo, iPods and streaming music. He had made it all possible, without ever quite grasping how to make the most of it for himself.





GO ON ▶

1. **Part A**

Read the sentence from paragraph 1.

These are some of the names someone wrote in a logbook in Thomas Edison's laboratory in 1877, after Edison and his assistants invented the first rudimentary machine for recording and playing back sounds.

What is the meaning of the word **rudimentary** as it is used in the sentence?

Ⓐ basic

Ⓑ mobile

Ⓒ practical

Ⓓ original

2. **Part B**

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

Ⓐ "The phonograph, his first invention to make him world-famous, is a perfect example." (paragraph 2)

Ⓑ "It was also the outcome of an amazing burst of inventiveness." (paragraph 3)

Ⓒ "But the primitive phonograph that Edison demonstrated for the editors of *Scientific American* that December remained exceedingly limited." (paragraph 6)

Ⓓ "When word of the invention spread, however, the outside world saw greater possibilities." (paragraph 6)

3. **Part A**

Which statement describes the central idea of "The Incredible Talking Machine"?

Ⓐ Edison was dependent on his assistants and backers to be successful.

Ⓑ Edison was never able to comprehend the full potential of his invention.

Ⓒ Edison was more gifted at promoting his inventions than designing them.

Ⓓ Edison was so impressed with his own invention that he ignored constructive criticism.

4. **Part B**

Select **two** pieces of evidence from the article that **best** support the answer to Part A.

Ⓐ "From the first, they thought it would be used to reproduce the human voice, but they had no clear idea of its exact purpose." (paragraph 1)

Ⓑ "The staff went on working through the night, fiddling with the gizmo—and thus occurred the first midnight recording session." (paragraph 4)

Ⓒ "At best, he thought, it might be an office machine allowing businessmen to dictate letters." (paragraph 5)

Ⓓ "Still, the editors were excited enough to publish an admiring bulletin about the device—a first shot that set off an avalanche of publicity." (paragraph 7)

Ⓔ "To him, the idea that his most cherished invention faced competition was unendurable." (paragraph 8)

Ⓕ "He dismissed 'miserable dance and ragtime selections' and described jazz as something for 'the nuts.' " (paragraph 9)



GO ON ▶

5. **Part A**

How does the author of "The Incredible Talking Machine" **mainly** present information throughout the article?

Ⓐ by presenting a cause and its effects

Ⓑ by describing events in sequential order

Ⓒ by explaining a problem and its solution

Ⓓ by comparing and contrasting events

6. **Part B**

Which sentence from the article **best** supports the answer to Part A?

Ⓐ "If the paper were then pulled through the rollers again with the needle resting in the groove, the indentations would move the attached diaphragm . . ." (paragraph 3)

Ⓑ "It broke down frequently and required a trained technician's constant attention." (paragraph 7)

Ⓒ "Ten years elapsed before Edison returned to the phonograph, only after a competitor developed a wax-coated cylinder that could be removed without ruining the recording. . . ." (paragraph 8)

Ⓓ "The other phonograph companies introduced radios but Edison refused, wanting nothing to do with the medium's inferior sound quality." (paragraph 10)

# HISTORY OF THE CYLINDER PHONOGRAPH

Read the passage from "History of the Cylinder Phonograph." Then answer the questions.

# from "History of the Cylinder Phonograph"

1 The phonograph was developed as a result of Thomas Edison's work on two other inventions, the telegraph and the telephone. In 1877, Edison was working on a machine that would transcribe telegraphic messages through indentations on paper tape, which could later be sent over the telegraph repeatedly. This development led Edison to speculate that a telephone message could also be recorded in a similar fashion. He experimented with a diaphragm which had an embossing point and was held against rapidly moving paraffin paper. The speaking vibrations made indentations in the paper. Edison later changed the paper to a metal cylinder with tin foil wrapped around it. The machine had two diaphragm-and-needle units, one for recording, and one for playback. When one would speak into a mouthpiece, the sound vibrations would be indented onto the cylinder by the recording needle in a vertical (or hill and dale) groove pattern. Edison gave a sketch of the machine to his mechanic, John Kruesi, to build, which Kruesi supposedly did within 30 hours. Edison immediately tested the machine by speaking the nursery rhyme into the mouthpiece, "Mary had a little lamb." To his amazement, the machine played his words back to him.

2 Although it was later stated that the date for this event was on August 12, 1877, some historians believe that it probably happened several months later, since Edison did not file for a patent until December 24, 1877. Also, the diary of one of Edison's aides, Charles Batchelor, seems to confirm that the phonograph was not constructed until December 4, and finished two days later. The patent on the phonograph was issued on February 19, 1878. The invention was highly original. The only other recorded evidence of such an invention was in a paper by French scientist Charles Cros, written on April 18, 1877. There were some differences, however, between the two men's ideas, and Cros's work remained only a theory, since he did not produce a working model of it.

3 Edison took his new invention to the offices of *Scientific American* in New York City and showed it to staff there. As the December 22, 1877, issue reported, "Mr. Thomas A. Edison recently came into this office, placed a little machine on our desk, turned a crank, and the machine inquired as to our health, asked how we liked the phonograph, informed us that it was very well, and bid us a cordial good night." Interest was great, and the invention was reported in several New York newspapers, and later in other American newspapers and magazines.

4 The Edison Speaking Phonograph Company was established on January 24, 1878, to exploit the new machine by exhibiting it. Edison received $10,000 for the manufacturing and sales rights and 20% of the profits. As a novelty, the machine was an instant success, but was difficult to operate except by experts, and the tin foil would last for only a few playings.



GO ON ▶

5 Ever practical and visionary, Edison offered the following possible future uses for the phonograph in the *North American Review* in June 1878:

1. Letter writing and all kinds of dictation without the aid of a stenographer.
2. Phonographic books, which will speak to blind people without effort on their part.
3. The teaching of elocution.
4. Reproduction of music.
5. The "Family Record"—a registry of sayings, reminiscences, etc., by members of a family in their own voices, and of the last words of dying persons.
6. Music-boxes and toys.
7. Clocks that should announce in articulate speech the time for going home, going to meals, etc.
8. The preservation of languages by exact reproduction of the manner of pronouncing.
9. Educational purposes; such as preserving the explanations made by a teacher, so that the pupil can refer to them at any moment, and spelling or other lessons placed upon the phonograph for convenience in committing to memory.
10. Connection with the telephone, so as to make that instrument an auxiliary in the transmission of permanent and invaluable records, instead of being the recipient of momentary and fleeting communication.

6 Eventually, the novelty of the invention wore off for the public, and Edison did no further work on the phonograph for a while, concentrating instead on inventing the incandescent light bulb.

"The History of the Edison Cylinder Phonograph"—Public Domain/The Library of Congress



GO ON ▶

1 **Part A**

In paragraph 4, what is the meaning of the word **exploit**?

Ⓐ research
Ⓑ promote
Ⓒ improve
Ⓓ defend

2. **Part B**

What phrase from paragraph 4 supports the answer to Part A?

Ⓐ "... machine was an instant success ..."
Ⓑ "... difficult to operate ..."
Ⓒ "... except by experts ..."
Ⓓ "... last for only a few playings."

3. **Part A**

Which part of the invention process was **most likely** the key step for securing the patent?

Ⓐ testing the machine

Ⓑ improving the machine's parts

Ⓒ constructing the original machine

Ⓓ demonstrating the machine to the public

4. **Part B**

Which statement from the passage supports the answer to Part A?

Ⓐ "Edison later changed the paper to a metal cylinder with tin foil wrapped around it." (paragraph 1)

Ⓑ "To his amazement, the machine played his words back to him." (paragraph 1)

Ⓒ ". . . and Cros's work remained only a theory, since he did not produce a working model of it." (paragraph 2)

Ⓓ "Interest was great, and the invention was reported in several New York newspapers. . . ." (paragraph 3)



GO ON ▶

PSST...HEY, YOU

Read the article "Psst . : . Hey, You." Then answer the questions.

# Psst . . . Hey, You

by Mark Fischetti

1 You are walking down a quiet grocery store aisle when suddenly a voice says: "Thirsty? Buy me." You stop in front of the soda display, but no one is next to you, and shoppers a few feet away do not seem to hear a thing.

2 At that moment, you are standing in a cylinder of sound. Whereas a loudspeaker broadcasts sound in all directions, the way a lightbulb radiates light, a directional speaker shines a beam of waves akin to a spotlight. The beam consists of ultrasound waves, which humans cannot hear, but which can emit audible tones as they interact with air. By describing these interactions mathematically, engineers can coax a beam to exude voice, music or any other sound.

3 Military and sonar researchers tried to harness the phenomenon as far back as the 1960s but only managed to generate highly distorted audible signals. In 1998 Joseph Pompei, then at the Massachusetts Institute of Technology, published algorithms that cut the distortion to only a few percent. He then designed an amplifier, electronics, and speakers to produce ultrasound "that is clean enough to generate clean audio," Pompei says. He trademarked the technology Audio Spotlight and started Holosonics, Inc., in Watertown, MA, in 1999. Rival inventor Woody Norris markets a competing product called HyperSonic Sound from his American Technology Corporation in San Diego.

4 Pompei's speakers are installed in company lobbies, and above exhibits at the Boston Museum of Fine Arts and Walt Disney World's Epcot Center, among other locations. Narrations inform visitors standing in front of artifacts or video screens without filling the rooms with noise. Department stores have tried the arrangement for retail displays, and automakers are experimenting with them so passengers can hear only their own music or movies. A speaker above a recliner in the living room would allow Dad to hear the television while other family members read on the couch in peace.

5 Detractors say that in certain situations headphones can provide similar benefits, and note random problems, such as unwanted reflections off a car seat. But the primary obstacle to wider deployment is cost: systems can run from $600 to $1,000 or more. If the price drops, consumers are more likely to consider buying the gear . . . or encounter it while shopping.

GO ON ▶

DID YOU KNOW . . .

- **BOUNCED:** Ultrasound waves remain in a tight column where they reflect off a hard, smooth surface. Police teams could bounce a beam off a building at the end of an alley or off a distant window inside a warehouse to flush out suspects, who would run away from the sound—and right into the officers' waiting arms.
- **BATS NOT DOGS:** Certain animals can detect the ultrasound noise behind audible directed sound. The ultrasound speakers emit frequencies from 40,000 to 80,000 cycles a second, or hertz (Hz). Humans typically hear frequencies between 20 and 20,000 Hz. Dogs can hear up to 40,000 Hz or so, mice up to 90,000, and bats, porpoises, and beluga whales up to 100,000 Hz or higher.
- **BONUS:** Middle ear bones limit human hearing to below 20,000 Hz. But researchers have applied ultrasound up to 200,000 Hz to the skulls of volunteers, some of whom report "hearing" sounds; the skull may be distorting vibrations that reach the cochlea.





GO ON ▶

1. **Part A**

In paragraph 2, how does the author help the reader understand how ultrasound works?

Ⓐ by describing the features of new technology

Ⓑ by using familiar concepts to explain new technology

Ⓒ by explaining how researchers discovered new technology

Ⓓ by providing additional resources about the new technology

2. **Part B**

Which sentence from paragraph 2 **best** supports the answer to Part A?

Ⓐ "At that moment, you are standing in a cylinder of sound."

Ⓑ "Whereas a loudspeaker broadcasts sound in all directions, the way a lightbulb radiates light, a directional speaker shines a beam of waves akin to a spotlight."

Ⓒ "The beam consists of ultrasound waves, which humans cannot hear, but which can emit audible tones as they interact with air."

Ⓓ "By describing these interactions mathematically, engineers can coax a beam to exude voice, music or any other sound."

3. **Part A**

What is the central idea of "Psst . . . Hey, You" that is supported by the other articles?

Ⓐ Sound technology continues to evolve.

Ⓑ Modern inventors must compete for recognition.

Ⓒ Directional speakers are useful in commercial business.

Ⓓ Advances in technology are prohibitively expensive.

4. **Part B**

Which sentence from the article **best** supports the answer to Part A?

Ⓐ "He then designed an amplifier, electronics, and speakers to produce ultrasound 'that is clean enough to generate clean audio,' Pompei says." (paragraph 3)

Ⓑ "Rival inventor Woody Norris markets a competing product called HyperSonic Sound from his American Technology Corporation in San Diego." (paragraph 3)

Ⓒ "Pompei's speakers are installed in company lobbies, and above exhibits at the Boston Museum of Fine Arts and Walt Disney World's Epcot Center, among other locations." (paragraph 4)

Ⓓ "But the primary obstacle to wider deployment is cost: systems can run from $600 to $1,000 or more." (paragraph 5)

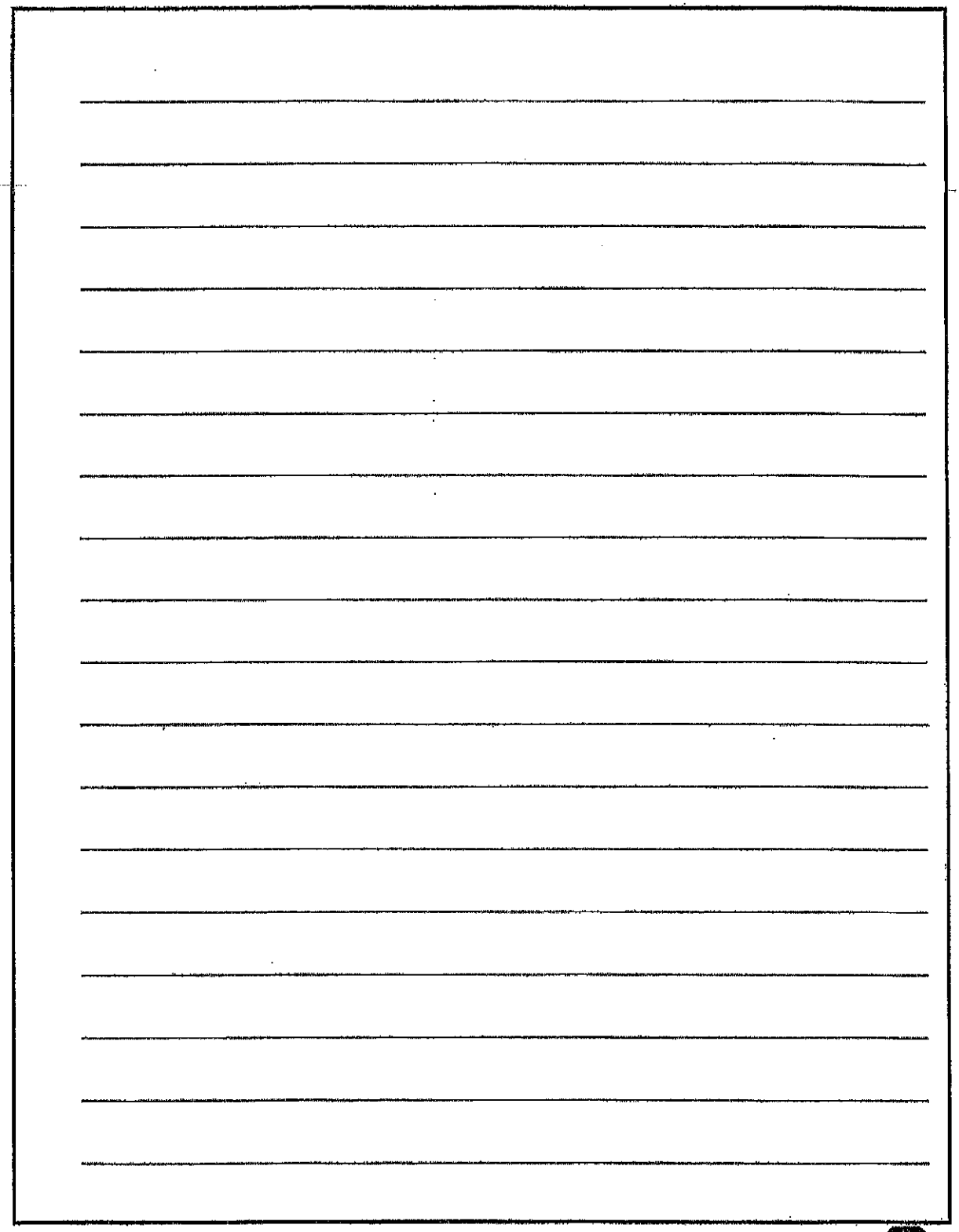


GO ON ▶

You have now read **two** articles about the beginning of sound technology and **one** article about modern technology. Write an essay explaining how the process of refining and marketing the phonograph is similar to the development of the Audio Spotlight in "Psst . . . Hey, You." Be sure to use details from all **three** articles to support your answer.

GO ON ▶

GO ON ▶




STOP

| 8th Grade Math | | | |
|---|---|---|---|
| **Date** | **Lesson** | **Objective** | **Assignment** |
| Monday, March 30 | Unit 6, Lesson 4<br>Fitting a Line to Data | • I can pick out outliers on a scatter plot.<br>• I can use a model to predict values for data. | Complete **Daily Warm-Up**<br><br>Complete **Illustrative Mathematics Lesson** for the Day<br>For each lesson:<br><br>4. Review Lesson Summary<br>5. Complete Lesson Activities<br>6. Complete Practice Problems |
| Tuesday, March 31 | Unit 6, Lesson 5<br>Describing Trends in Scatter Plots | • I can draw a line to fit data in a scatter plot.<br>• I can say whether data in a scatter plot has a positive or negative association (or neither). | |
| Wednesday, April 1 | Unit 6, Lesson 6<br>The Slope of a Fitted Line | • I can use the slope of a line fit to data in a scatter plot to say how the variables are connected in real-world situations. | |
| Thursday, April 2 | Unit 6, Lesson 7<br>Observing More Patterns in Scatter Plots | • I can pick out clusters in data from a scatter plot.<br>• I can use a scatter plot to decide if two variables have a linear association. | |
| Friday, April 3 | Unit 6, Lesson 8<br>Analyzing Bivariate Data | • I can analyze a set of data to determine associations between two variables. | |
| Monday, April 6 | Unit 6, Lesson 9<br>Looking for Associations | • I can identify the same data represented in a bar graph, a segmented bar graph, and a two-way table.<br>• I can use a two-way frequency table or relative frequency table to find associations among variables. | |
| Tuesday, April 7 | Unit 6, Lesson 10<br>Using Data Displays to Find Associations | • I can create relative frequency tables, bar graphs, and segmented bar graphs from frequency tables to find associations among variables | |
| Wednesday, April 8 | Unit 6 Review/Practice | Complete the practice unit assessment. | |
| **Spring Break: April 9- April 13** | | | |

# 8th Grade Warm Ups

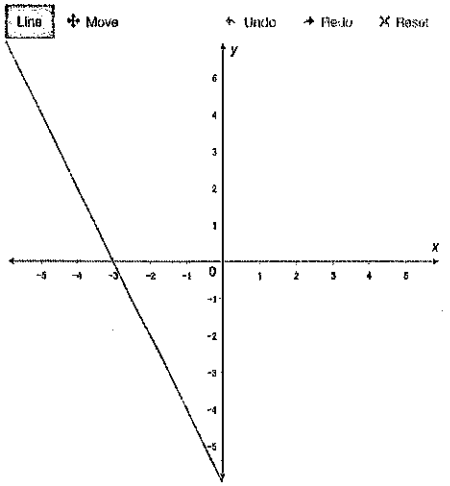
## Monday, March 30

Consider the system of equations.

$$\begin{cases} y = -2x - 6 \\ y = \frac{1}{4}x + 3 \end{cases}$$

**Part A**

The graph of $y = -2x - 6$ is shown on the coordinate plane. Graph the equation $y = \frac{1}{4}x + 3$ on the coordinate plane.




**Part B**

What is the solution to the system of equations?

Enter your answer in the boxes.

( , )

## Tuesday, March 31

Consider the two linear functions.

**Function 1**

| $x$ | $y$ |
|---|---|
| 0 | 3 |
| 2 | 8 |
| 4 | 13 |

**Function 2:** $y = \frac{7}{3}x - 15$

What is the rate of change and initial value for each function?

## Wednesday, April 1

The functions represent the weight, $w$, in pounds, of two monkeys after $t$ weeks since birth.

**Monkey A**

| $t$ | 1 | 3 | 4 | 6 |
|---|---|---|---|---|
| $w$ | 5 | 13 | 17 | 25 |

**Monkey B**

$w = 4t + 3$

Based on these functions, which monkey gains weight at a faster rate, and which monkey will weigh more at 10 weeks? Select **all** that apply.

- ☐ Monkey A gains weight at a faster rate.
- ☐ Monkey B gains weight at a faster rate.
- ☐ Both monkeys gain weight at the same rate.
- ☐ Monkey A will weigh more at 10 weeks.
- ☐ Monkey B will weigh more at 10 weeks.
- ☐ Both monkeys will weigh the same amount at 10 weeks.

Calculator

## Thursday, April 2

To be a member at Sal's gym, there is a one-time sign-up fee plus a monthly fee for each month of membership. The table shows the total cost to be a member of the gym for different numbers of months.

| Number of Months | Total Cost |
|---|---|
| 3 | $53.97 |
| 6 | $77.94 |
| 12 | $125.88 |

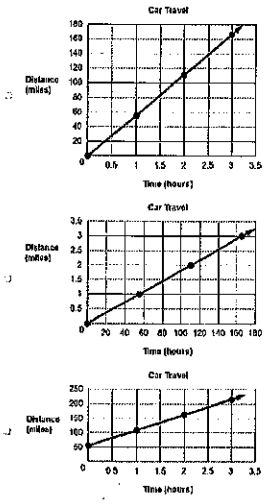
Create a function that gives the total cost, $C$, in dollars, to be a member of the gym given the number of months, $m$, of membership.

## Friday, April 3

Lisa is planning a trip where she will travel 231 miles. She is decking whether to travel by car or train.

Part A

Lisa writes the equation $y = 55x$ to model the distance in miles, $y$, traveling $x$ hours in her car. Which graph models the equation and which statement describes the unit rate? Select the two correct answers.




- The unit rate is 55 which represents traveling 55 miles per hour.
- The unit rate is 55 which represents traveling 55 hours per mile.
- The unit rate is 110 which represents traveling 110 miles per hour.
- The unit rate is 110 which represents traveling 110 hours per mile.

## Monday, April 6

Function Z is a linear function with an initial value of 3 and a rate of change of $\frac{1}{2}$.

Function P is a linear function that passes through the points (3,9) and (0, 3).

Which statements are true? **Select all that apply.**

A. The two functions have the same initial value.
B. The initial value in function Z is greater than the initial value in Function P.
C. The rate of change in Function P is greater than the rate of change in Function Z.
D. The rate of change in Function Z is the same as the rate of change in Function P.

Which line passes through (-2, 1) and (2, 3)?

(A) $y = 2x$
(B) $y = x + 2$
(C) $y = \frac{1}{2}x + 2$
(D) $y = 2x + \frac{1}{2}$

## Tuesday, April 7

The equation of line *s* is $y = -3x + 2$.

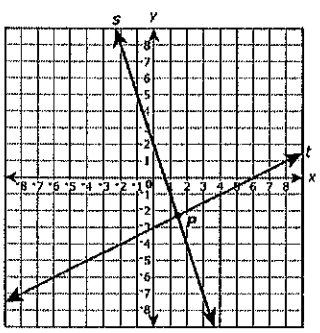
The equation of line *t* is $y = \frac{1}{2}x - 3$.

Line *s* and line *t* form a system of equations. The solution to the system of equations is located at point *P*.

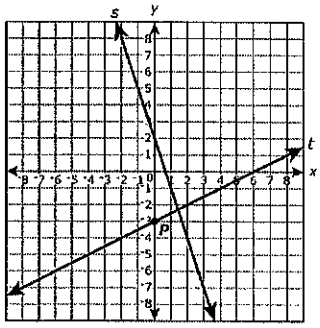
**Part A**

Which graph correctly shows line *s*, line *t*, and point *P*?

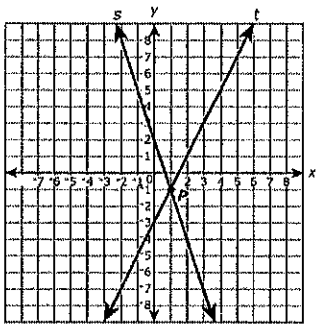
A.



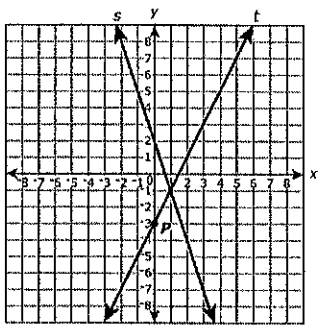

B.




C.




D.




## Wednesday, April 8

The average price of a movie ticket from 1960 to 1990 can be modeled by the equation $y = 0.12x + 0.48$, where *y* represents the average price, in dollars, and *x* represents the number of years since 1960.

**Part A**

What does the slope of the graph of the equation $y = 0.12x + 0.48$ represent?

A. the average price of a movie ticket in 1960

B. the average price of a movie ticket in 1990

C. the increase in the average price of a movie ticket each year from 1960 to 1990

D. the total increase in the average price of a movie ticket every 30 years

# Unit 6
# Student Task Statements

## Associations in Data

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



## FirstLine Schools' 8th Grade Math Distance Learning Materials

## March 30-April 8

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Unit 6, Lesson 4

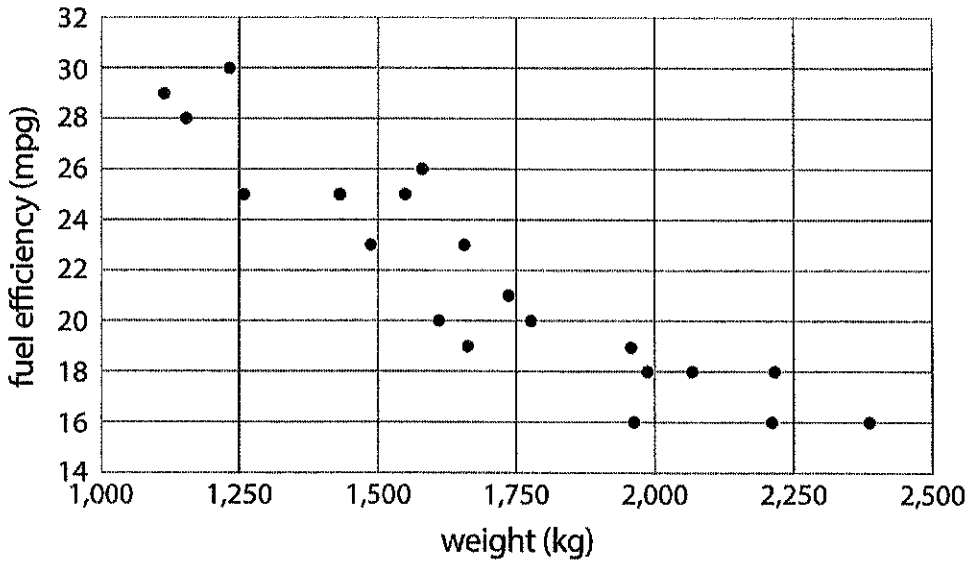
# Fitting a Line to Data

Let's look at the scatter plots as a whole.

## 4.1 Predict This

Here is a scatter plot that shows weights and fuel efficiencies of 20 different types of cars.

If a car weighs 1,750 kg, would you expect its fuel efficiency to be closer to 22 mpg or to 28 mpg? Explain your reasoning.




## 4.2 Shine Bright

**Interactive digital version available**

a.openup.org/ms-math/en/s/ccss-8-6-4-2

Here is a table that shows weights and prices of 20 different diamonds.

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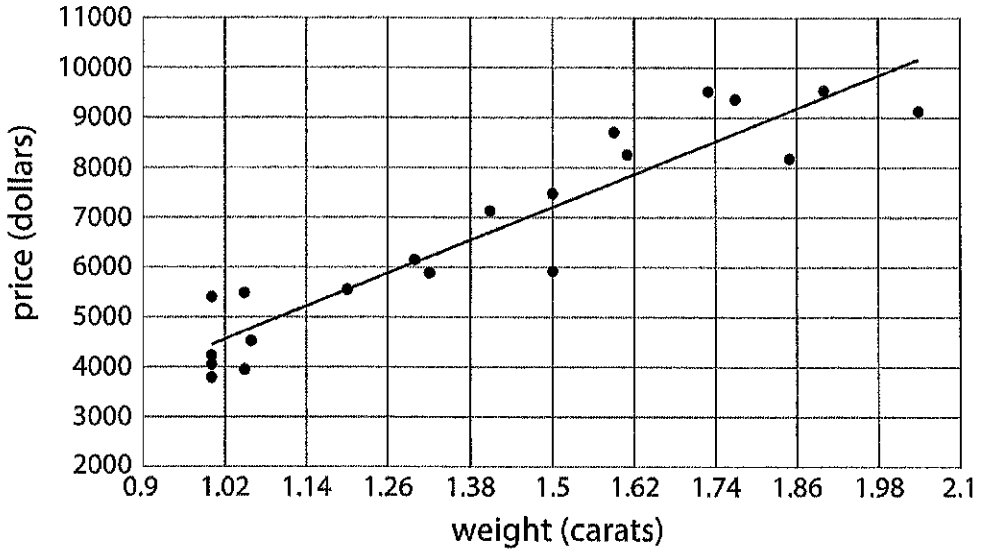
| weight (carats) | actual price (dollars) | predicted price (dollars) |
|---|---|---|
| 1 | 3,772 | 4,429 |
| 1 | 4,221 | 4,429 |
| 1 | 4,032 | 4,429 |
| 1 | 5,385 | 4,429 |
| 1.05 | 3,942 | 4,705 |
| 1.05 | 4,480 | 4,705 |
| 1.06 | 4,511 | 4,760 |
| 1.2 | 5,544 | 5,533 |
| 1.3 | 6,131 | 6,085 |
| 1.32 | 5,872 | 6,195 |
| 1.41 | 7,122 | 6,692 |
| 1.5 | 7,474 | 7,189 |
| 1.5 | 5,904 | 7,189 |
| 1.59 | 8,706 | 7,686 |
| 1.61 | 8,252 | 7,796 |
| 1.73 | 9,530 | 8,459 |
| 1.77 | 9,374 | 8,679 |
| 1.85 | 8,169 | 9,121 |
| 1.9 | 9,541 | 9,397 |
| 2.04 | 9,125 | 10,170 |

The scatter plot shows the prices and weights of the 20 diamonds together with the graph of $y = 5{,}520x - 1{,}091$.

NAME DATE PERIOD




The function described by the equation $y = 5{,}520x - 1{,}091$ is a *model* of the relationship between a diamond's weight and its price.

This model *predicts* the price of a diamond from its weight. These predicted prices are shown in the third column of the table.

1. Two diamonds that both weigh 1.5 carats have different prices. What are their prices? How can you see this in the table? How can you see this in the graph?

2. The model predicts that when the weight is 1.5 carats, the price will be $7,189. How can you see this in the graph? How can you see this using the equation?

3. One of the diamonds weighs 1.9 carats. What does the model predict for its price? How does that compare to the actual price?

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4. Find a diamond for which the model makes a very good prediction of the actual price. How can you see this in the table? In the graph?

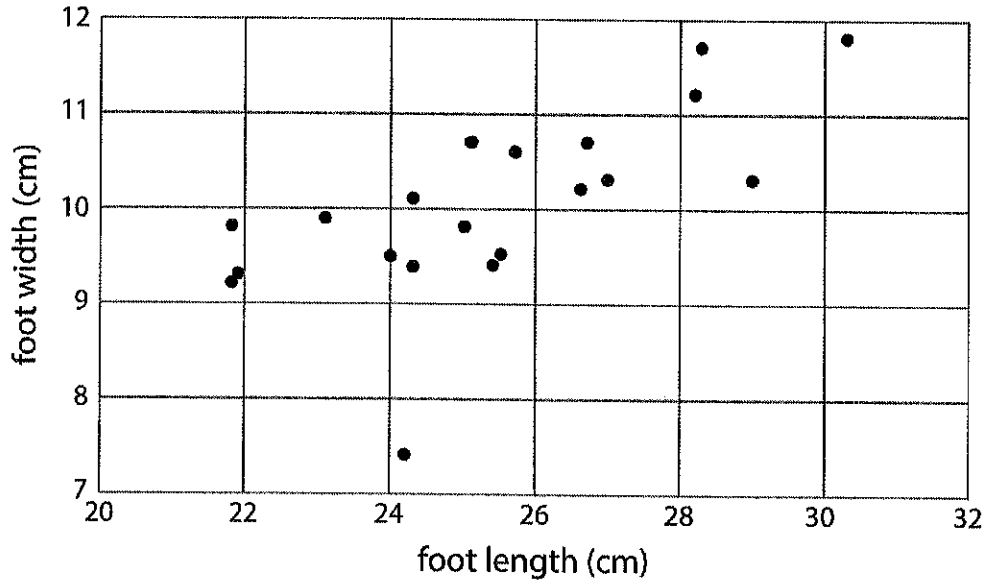
5. Find a diamond for which the model's prediction is not very close to the actual price. How can you see this in the table? In the graph?

# 4.3 The Agony of the Feet

**Interactive digital version available**

a.openup.org/ms-math/en/s/ccss-8-6-4-3

Here is a scatter plot that shows lengths and widths of 20 different left feet.

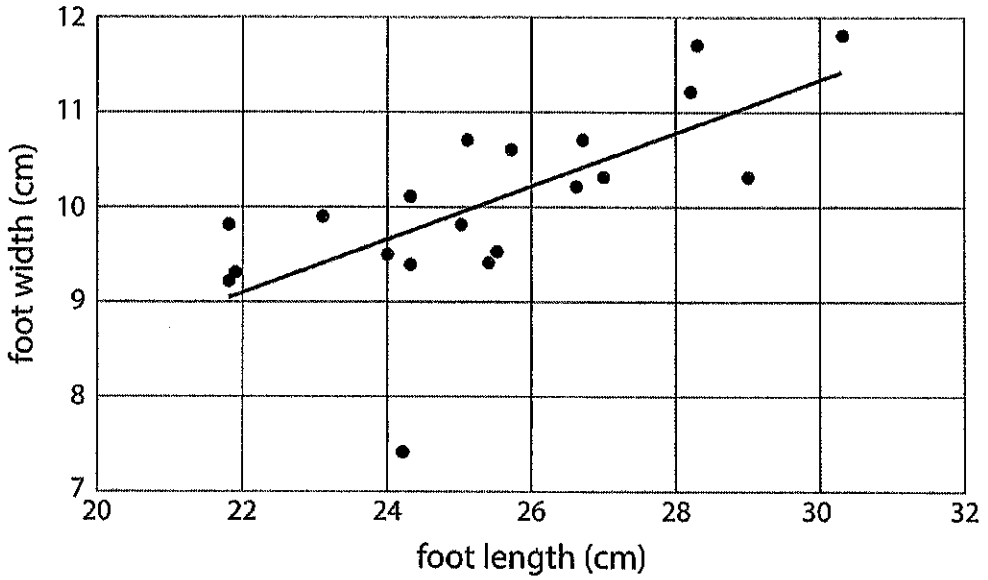



1. Estimate the lengths of the longest foot and the shortest foot.

NAME DATE PERIOD

2. Estimate the widths of the widest foot and the narrowest foot.

3. Here is the same scatter plot together with the graph of a model for the relationship between foot length and width.




Circle the data point that seems weird when compared to the model. What length and width does that point represent?

## Lesson 4 Summary

Sometimes, we can use a linear function as a model of the relationship between two variables. For example, here is a scatter plot that shows heights and weights of 25 dogs together with the graph of a linear function which is a model for the relationship between a dog's height and its weight.

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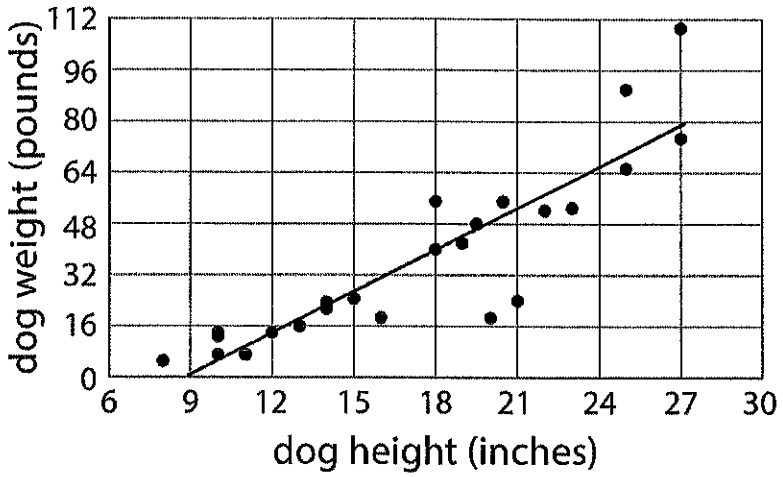



We can see that the model does a good job of predicting the weight given the height for some dogs. These correspond to points on or near the line. The model doesn't do a very good job of predicting the weight given the height for the dogs whose points are far from the line.

For example, there is a dog that is about 20 inches tall and weighs a little more than 16 pounds. The model predicts that the weight would be about 48 pounds. We say that the model *overpredicts* the weight of this dog. There is also a dog that is 27 inches tall and weighs about 110 pounds. The model predicts that its weight will be a little less than 80 pounds. We say the model *underpredicts* the weight of this dog.

Sometimes a data point is far away from the other points or doesn't fit a trend that all the other points fit. We call these **outliers**.

## Glossary Terms

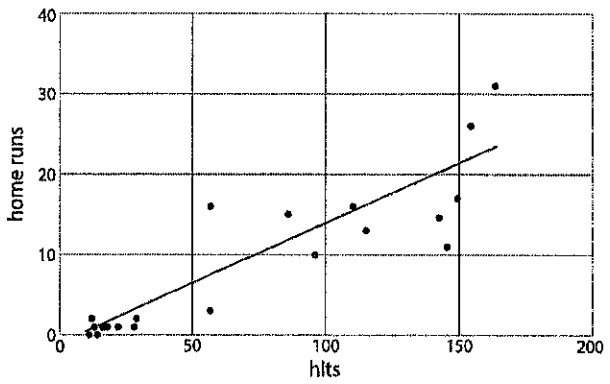
outlier

NAME DATE PERIOD

# Unit 6, Lesson 4
# Practice Problems

1. The scatter plot shows the number of hits and home runs for 20 baseball players who had at least 10 hits last season. The table shows the values for 15 of those players.

   The model, represented by $y = 0.15x - 1.5$, is graphed with a scatter plot.




| hits | home runs | predicted home runs |
|---|---|---|
| 12 | 2 | 0.3 |
| 22 | 1 | 1.8 |
| 154 | 26 | 21.6 |
| 145 | 11 | 20.3 |
| 110 | 16 | 15 |
| 57 | 3 | 7.1 |
| 149 | 17 | 20.9 |
| 29 | 2 | 2.9 |
| 13 | 1 | 0.5 |
| 18 | 1 | 1.2 |
| 86 | 15 | 11.4 |
| 163 | 31 | 23 |
| 115 | 13 | 15.8 |
| 57 | 16 | 7.1 |
| 96 | 10 | 12.9 |

   Use the graph and the table to answer the questions.

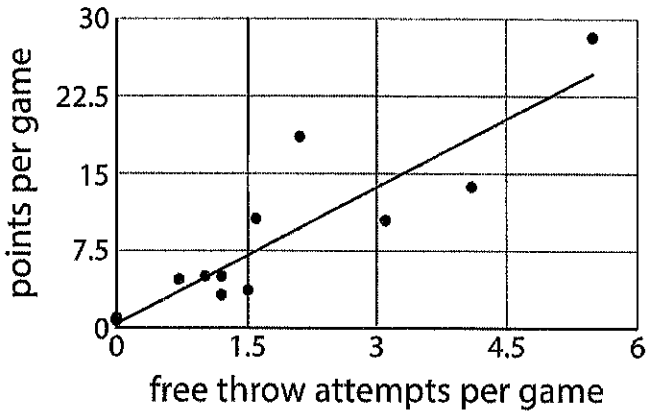
   a. Player A had 154 hits in 2015. How many home runs did he have? How many was he predicted to have?

   b. Player B was the player who most outperformed the prediction. How many hits did Player B have last season?

   c. What would you expect to see in the graph for a player who hit many fewer home runs than the model predicted?

2. Here is a scatter plot that compares points per game to free throw attempts per game for basketball players in a tournament. The model, represented by $y = 4.413x + 0.377$, is graphed with the scatter plot. Here, $x$ represents free throw attempts per game, and $y$ represents points per game.

NAME DATE PERIOD




a. Circle any data points that appear to be outliers.

b. What does it mean for a point to be far above the line in this situation?

c. Based on the model, how many points per game would you expect a player who attempts 4.5 free throws per game to have? Round your answer to the nearest tenth of a point per game.

d. One of the players scored 13.7 points per game with 4.1 free throw attempts per game. How does this compare to what the model predicts for this player?

NAME DATE PERIOD

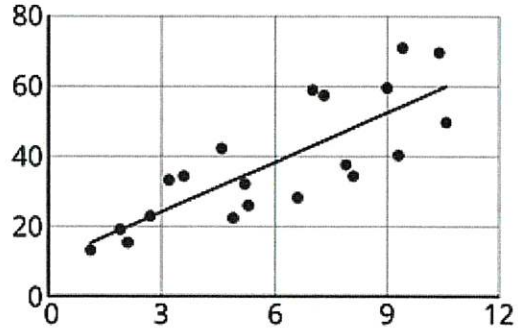
Unit 6, Lesson 5

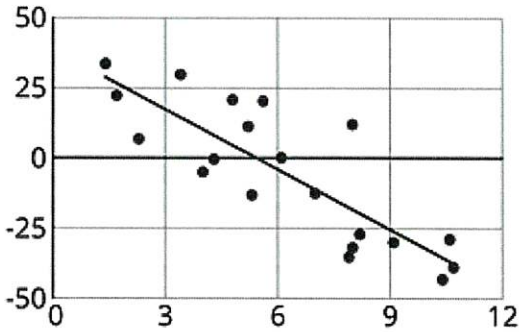
# Describing Trends in Scatter Plots

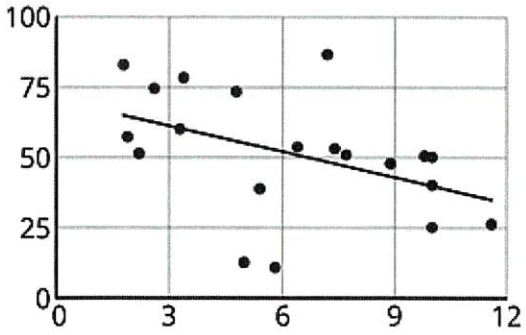
Let's look for associations between variables.

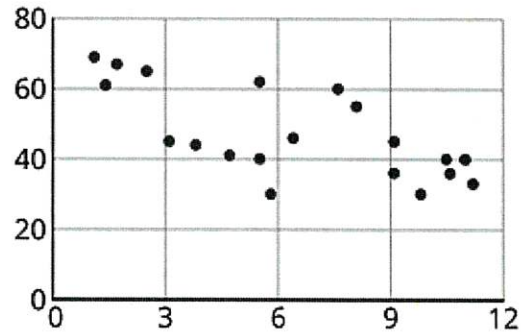
## 5.1 Which One Doesn't Belong: Scatter Plots

Which one doesn't belong?




## 5.2 Fitting Lines

**Interactive digital version available**

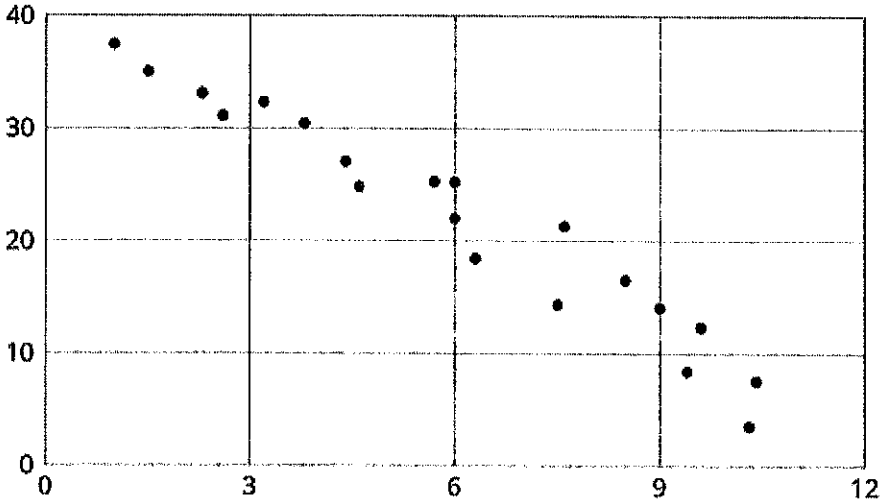
a.openup.org/ms-math/en/s/ccss-8-6-5-2

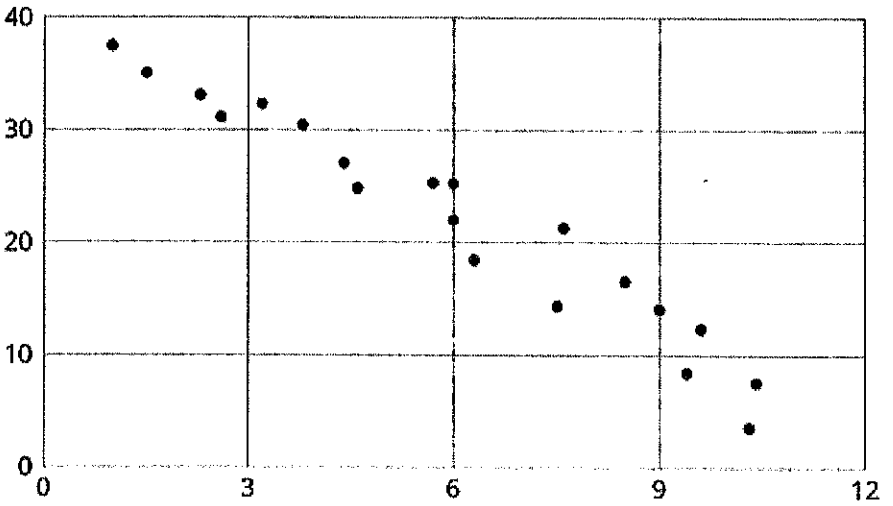
~~Your teacher will give you a piece of pasta and a straightedge.~~

**Use a straight edge (ruler, piece of paper, card) to help you draw lines.**

NAME DATE PERIOD

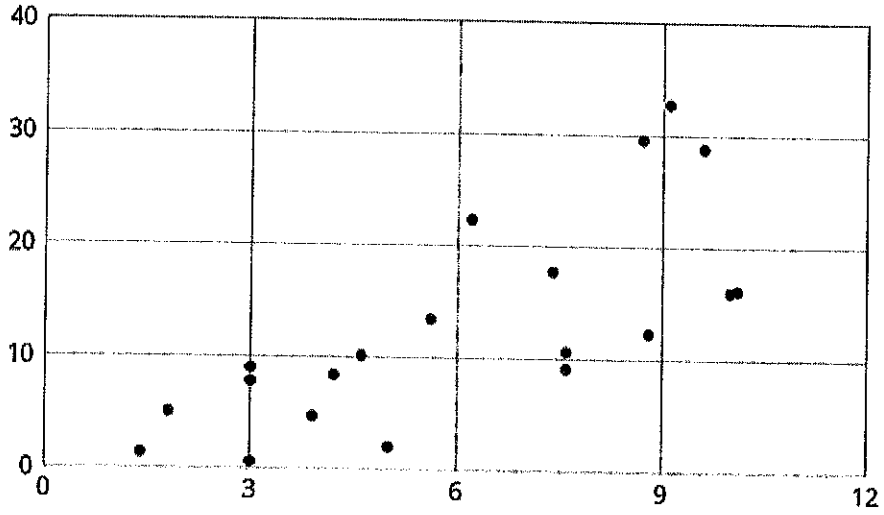
1. Here are two copies of the same scatter plot. Experiment with drawing lines to fit the data. Pick the line that you think best fits the data. Compare it with a partner's.

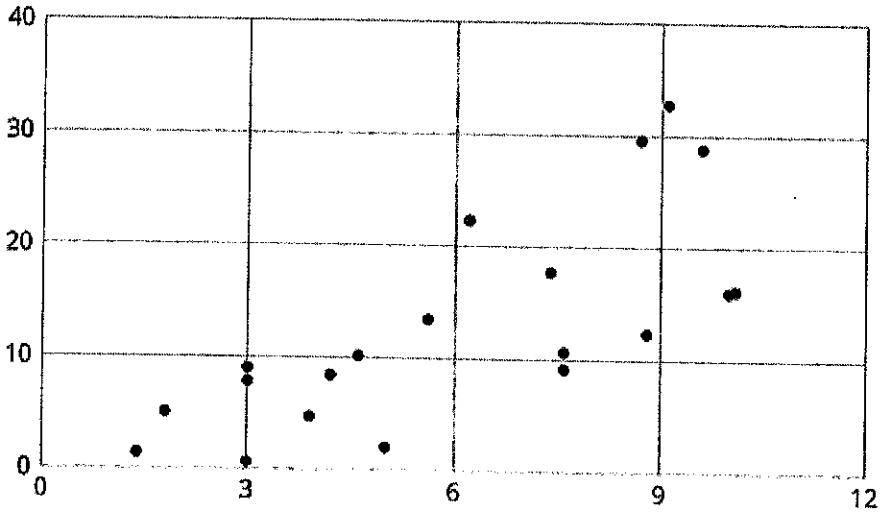


NAME DATE PERIOD

2. Here are two copies of another scatter plot. Experiment with drawing lines to fit the data. Pick the line that you think best fits the data. Compare it with a partner's.



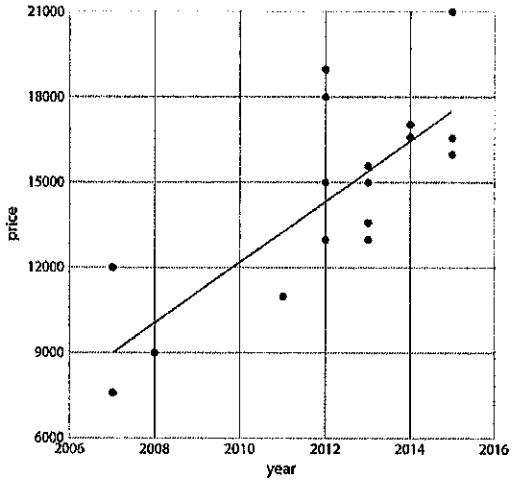




3. In your own words, describe what makes a line fit a data set well.

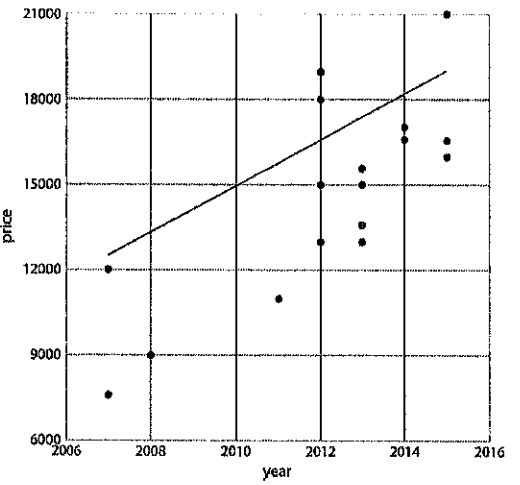
NAME DATE PERIOD

# 5.3 Good Fit Bad Fit

The scatter plots both show the year and price for the same 17 used cars. However, each scatter plot shows a different model for the relationship between year and price.




A




B

1. Look at Diagram A.
   a. For how many cars does the model in Diagram A make a good prediction of its price?

   b. For how many cars does the model underestimate the price?

   c. For how many cars does it overestimate the price?

2. Look at Diagram B.
   a. For how many cars does the model in Diagram B make a good prediction of its price?

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b. For how many cars does the model underestimate the price?

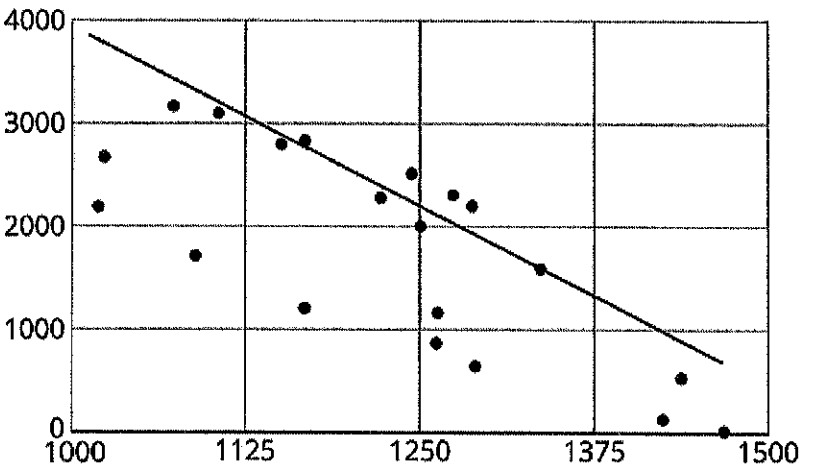
c. For how many cars does it overestimate the price?

3. For how many cars does the prediction made by the model in Diagram A differ by more than $3,000? What about the model in Diagram B?

4. Which model does a better job of predicting the price of a used car from its year?

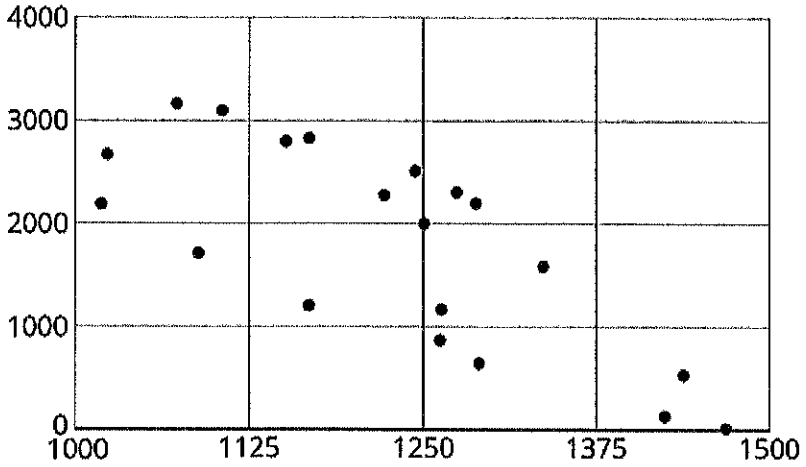
# 5.4 Practice Fitting Lines

1. Is this line a good fit for the data? Explain your reasoning.

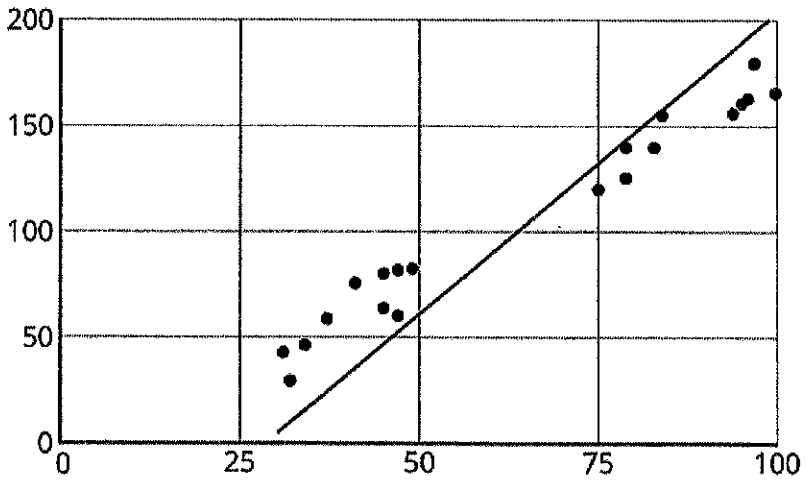



2. Draw a line that fits the data better.

NAME DATE PERIOD

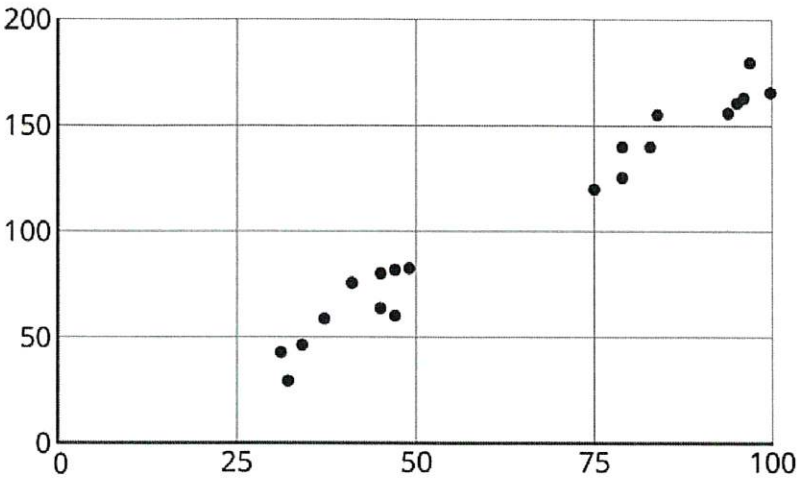



3. Is this line a good fit for the data? Explain your reasoning.

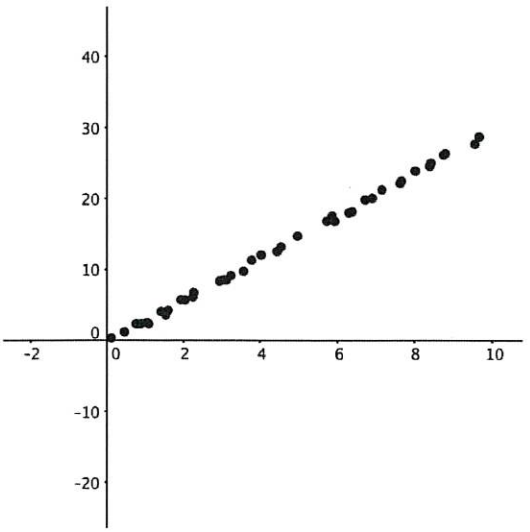


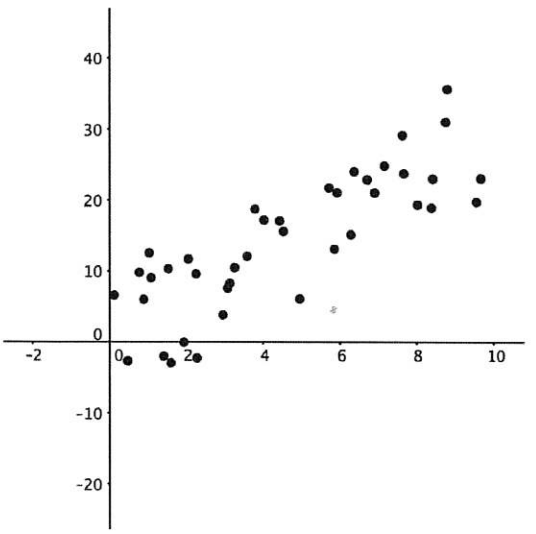

4. Draw a line that fits the data better.

NAME DATE PERIOD

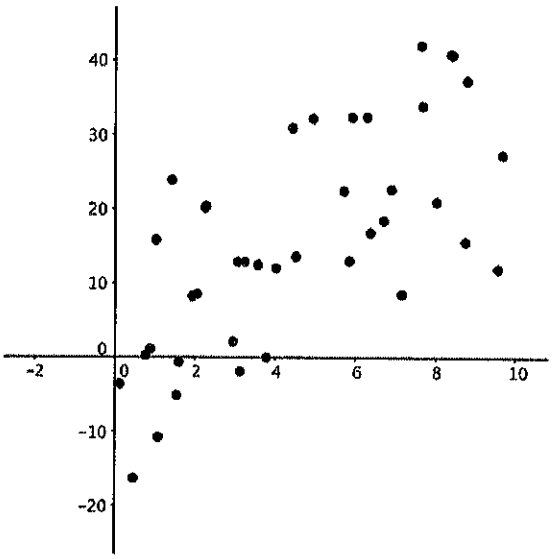



## Are you ready for more?



NAME DATE PERIOD




These scatter plots were created by multiplying the $x$-coordinate by 3 then adding a random number between two values to get the $y$-coordinate. The first scatter plot added a random number between -0.5 and 0.5 to the $y$-coordinate. The second scatter plot added a random number between -2 and 2 to the $y$-coordinate. The third scatter plot added a random number between -10 and 10 to the $y$-coordinate.

1. For each scatter plot, draw a line that fits the data.
2. Explain why some were easier to do than others.

## Lesson 5 Summary

When a linear function fits data well, we say there is a *linear association* between the variables. For example, the relationship between height and weight for 25 dogs with the linear function whose graph is shown in the scatter plot.

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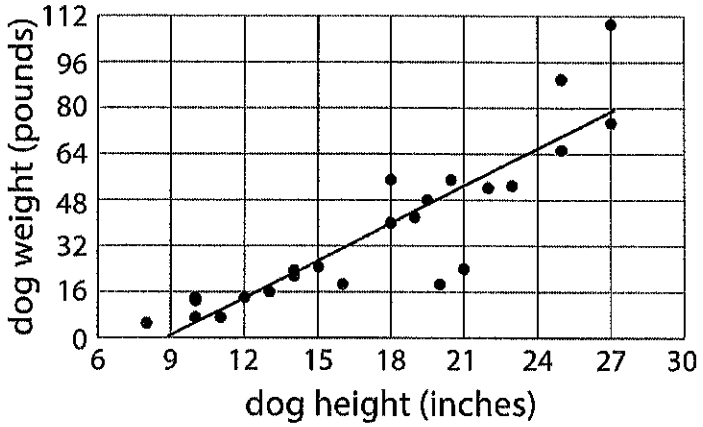
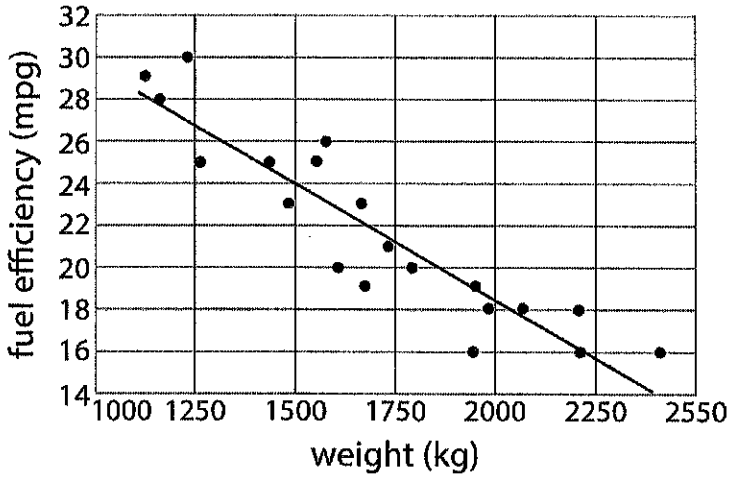



Because the model fits the data well and because the slope of the line is positive, we say that there is a **positive association** between dog height and dog weight.

What do you think the association between the weight of a car and its fuel efficiency is?




Because the slope of a line that fits the data well is negative, we say that there is a **negative association** between the fuel efficiency and weight of a car.

## Glossary Terms

negative association

positive association

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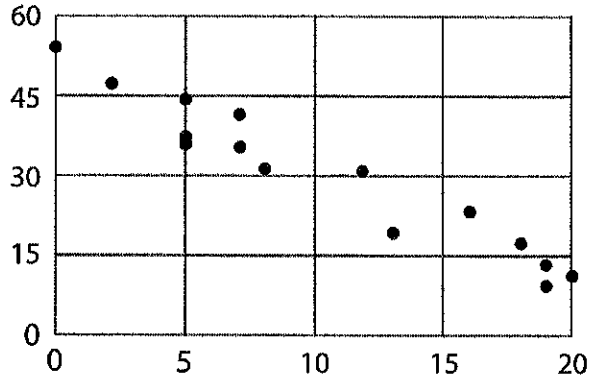
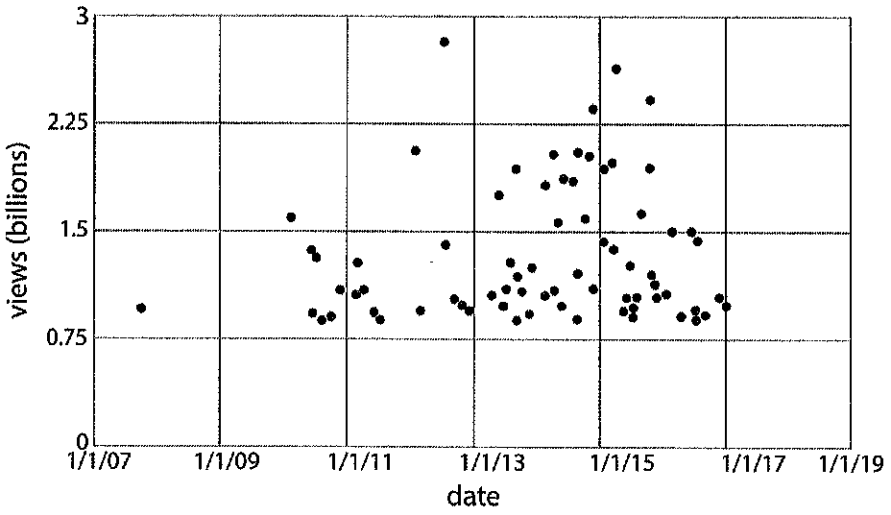
# Unit 6, Lesson 5
# Practice Problems

1. a. Draw a line that you think is a good fit for this data. For this data, the inputs are the horizontal values, and the outputs are the vertical values.




   b. Use your line of fit to estimate what you would expect the output value to be when the input is 10.

2. Here is a scatter plot that shows the most popular videos in a 10-year span.




   a. Use the scatter plot to estimate the number of views for the most popular video in this 10-year span.

   b. Estimate when the 4th most popular video was released.

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3. A recipe for bread calls for 1 teaspoon of yeast for every 2 cups of flour.

   a. Name two quantities in this situation that are in a functional relationship.

   b. Write an equation that represents the function.

   c. Draw the graph of the function. Label at least two points with input-output pairs.

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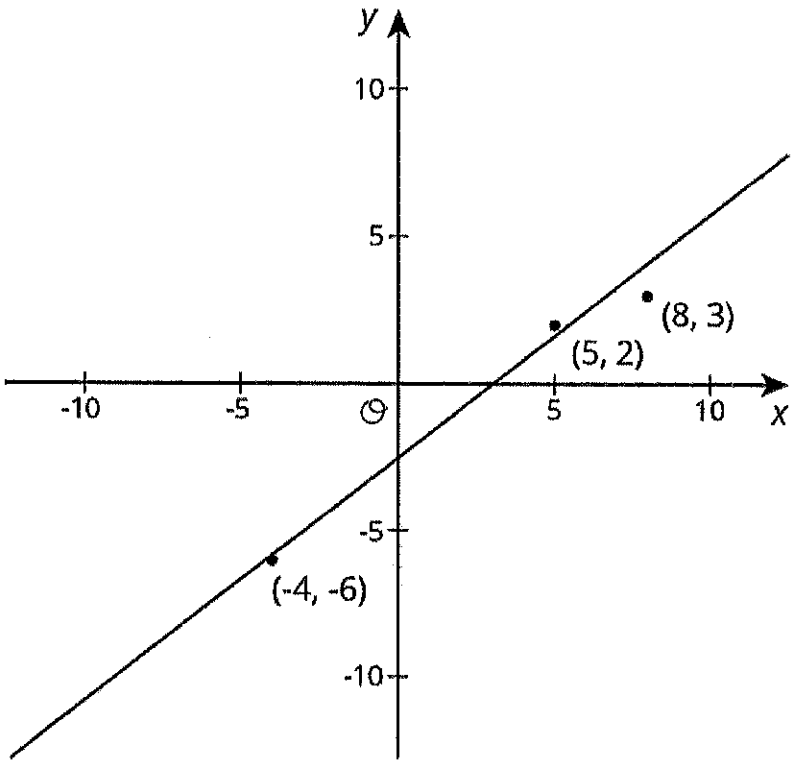
Unit 6, Lesson 6

# The Slope of a Fitted Line

Let's look at how changing one variable changes another.

## 6.1 Estimating Slope

Estimate the slope of the line.




## 6.2 Describing Linear Associations

For each scatter plot, decide if there is an association between the two variables, and describe the situation using one of these sentences:

- For these data, as _____ increases, _____ tends to increase.

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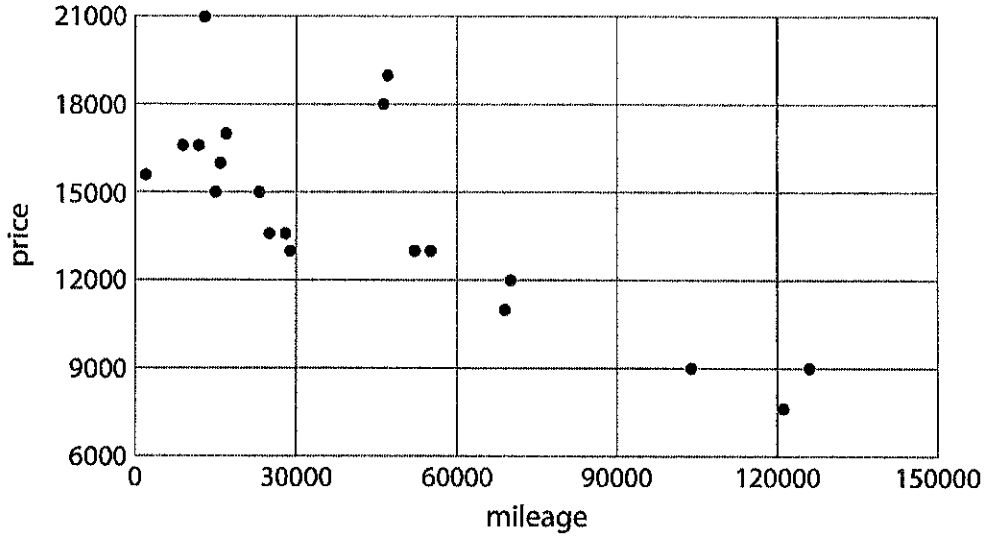
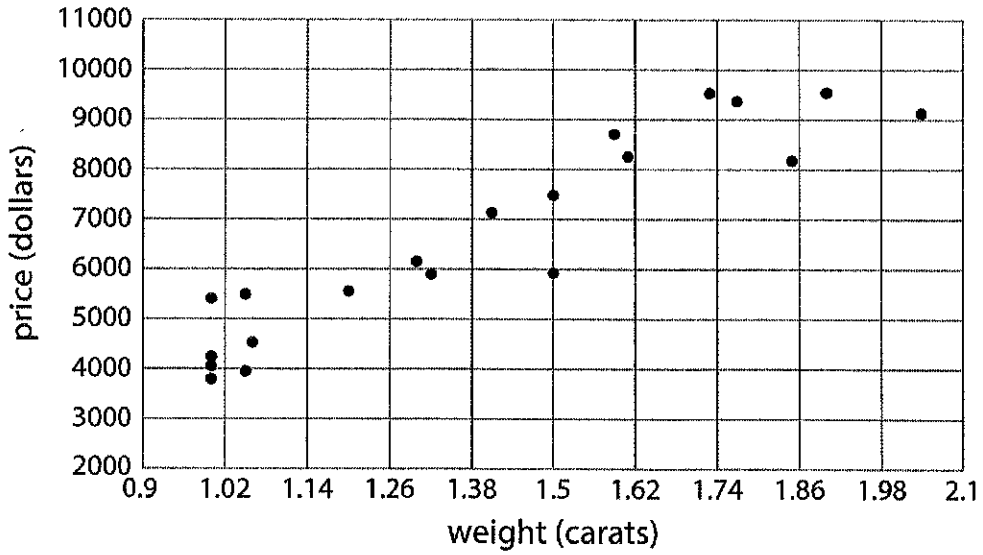
- For these data, as _____ increases, _____ tends to decrease.
- For these data, _____ and _____ do not appear to be related.



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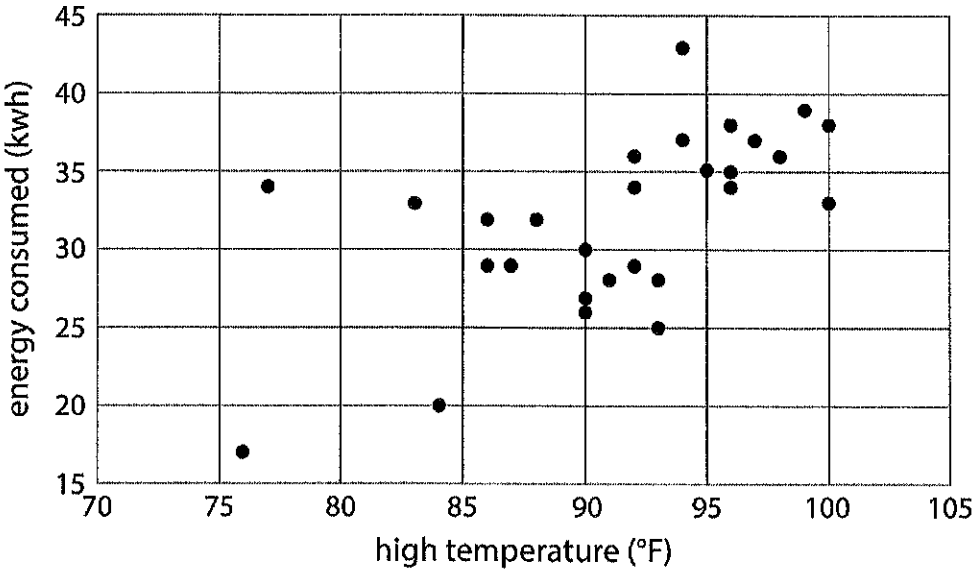


# 6.3 Interpreting Slopes

For each of the situations, a linear model for some data is shown.

1. What is the slope of the line in the scatter plot for each situation?

2. What is the meaning of the slope in that situation?

$y = 5{,}520.619x - 1{,}091.393$

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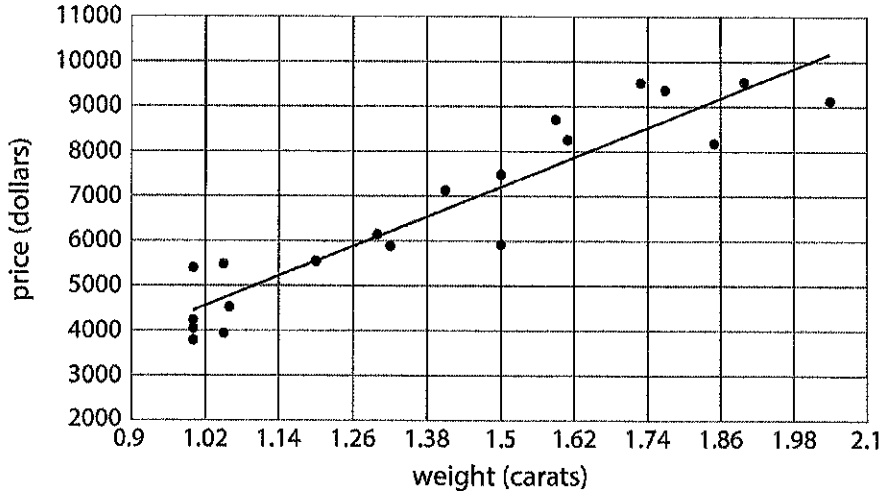
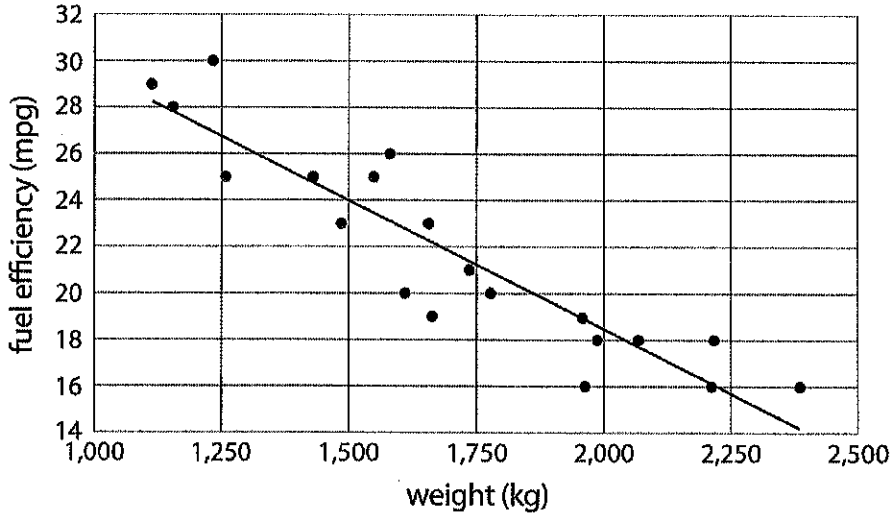



$y = -0.011x + 40.604$




$y = 0.59x - 21.912$

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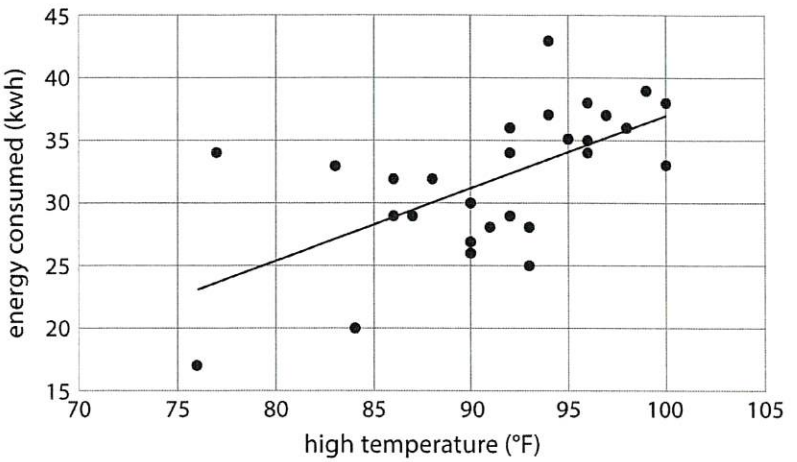
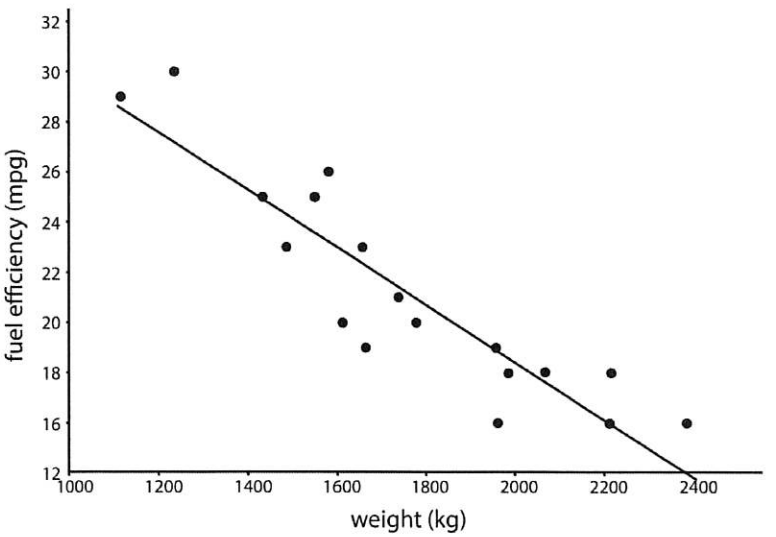



## Are you ready for more?

The scatter plot shows the weight and fuel efficiency data used in an earlier lesson along with a linear model represented by the equation $y = -0.0114x + 41.3021$.




1. What is the value of the slope and what does it mean in this context?
2. What does the other number in the equation represent on the graph? What does it mean in context?

3. Use the equation to predict the fuel efficiency of a car that weighs 100 kilograms.
4. Use the equation to predict the weight of a car that has a fuel efficiency of 22 mpg.

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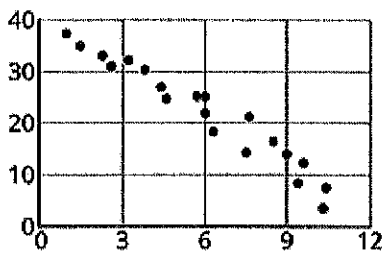
5. Which of these two predictions probably fits reality better? Explain.

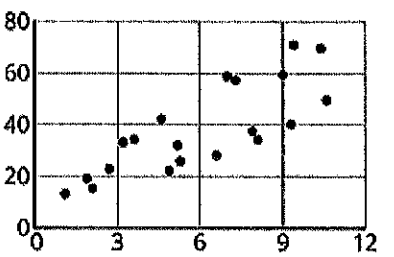
# 6.4 Positive or Negative?

1. For each of the scatter plots, decide whether it makes sense to fit a linear model to the data. If it does, would the graph of the model have a positive slope, a negative slope, or a slope of zero?

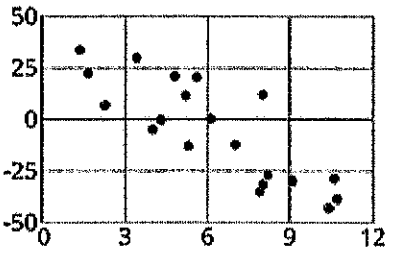
A



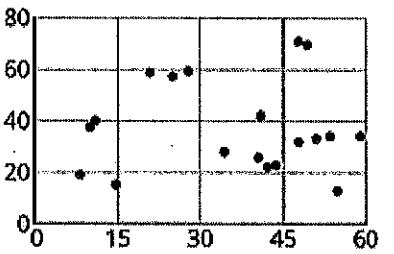

B



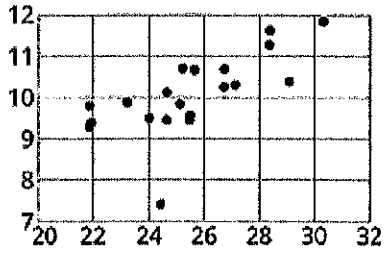

C




D




E




2. Which of these scatter plots show evidence of a positive association between the variables? Of a negative association? Which do not appear to show an association?

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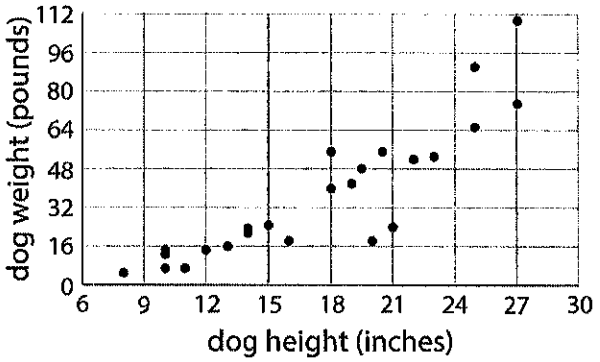
# Lesson 6 Summary

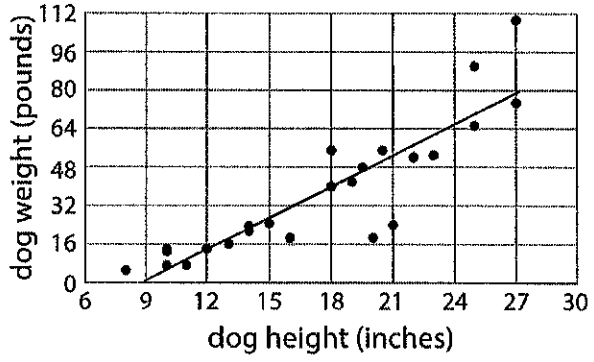
Here is a scatter plot that we have seen before. As noted earlier, we can see from the scatter plot that taller dogs tend to weigh more than shorter dogs. Another way to say it is that weight tends to increase as height increases. When we have a positive association between two variables, an increase in one means there tends to be an increase in the other.




We can quantify this tendency by fitting a line to the data and finding its slope. For example, the equation of the fitted line is

$$w = 4.27h - 37$$

where $h$ is the height of the dog and $w$ is the predicted weight of the dog.




The slope is 4.27, which tells us that for every 1-inch increase in dog height, the weight is predicted to increase by 4.27 pounds.
In our example of the fuel efficiency and weight of a car, the slope of the fitted line shown is -0.01.

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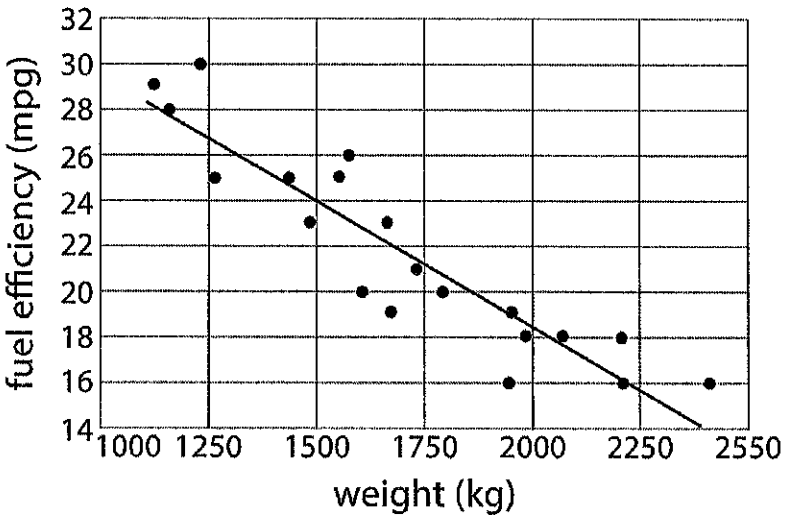


This tells us that for every 1-kilogram increase in the weight of the car, the fuel efficiency is predicted to decrease by 0.01 miles per gallon. When we have a negative association between two variables, an increase in one means there tends to be a decrease in the other.

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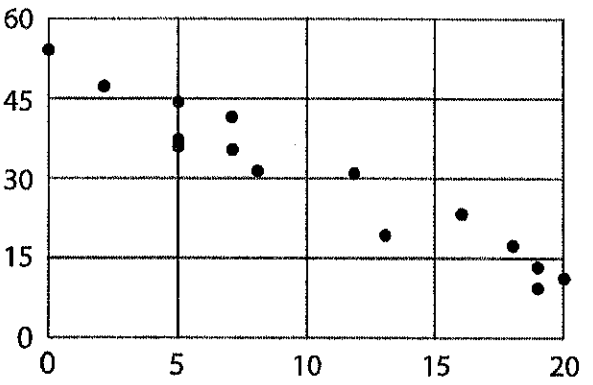
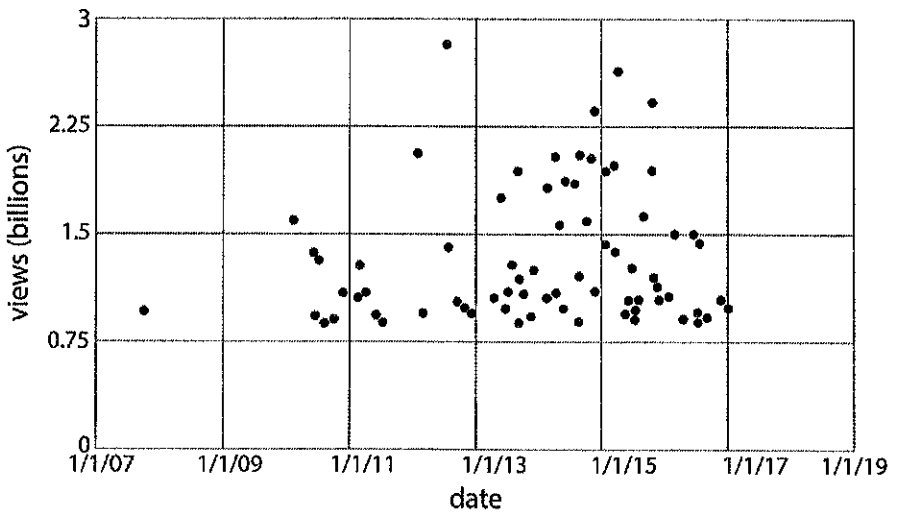
# Unit 6, Lesson 5
# Practice Problems

1. a. Draw a line that you think is a good fit for this data. For this data, the inputs are the horizontal values, and the outputs are the vertical values.




   b. Use your line of fit to estimate what you would expect the output value to be when the input is 10.

2. Here is a scatter plot that shows the most popular videos in a 10-year span.




   a. Use the scatter plot to estimate the number of views for the most popular video in this 10-year span.

   b. Estimate when the 4th most popular video was released.

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3. A recipe for bread calls for 1 teaspoon of yeast for every 2 cups of flour.

   a. Name two quantities in this situation that are in a functional relationship.

   b. Write an equation that represents the function.

   c. Draw the graph of the function. Label at least two points with input-output pairs.

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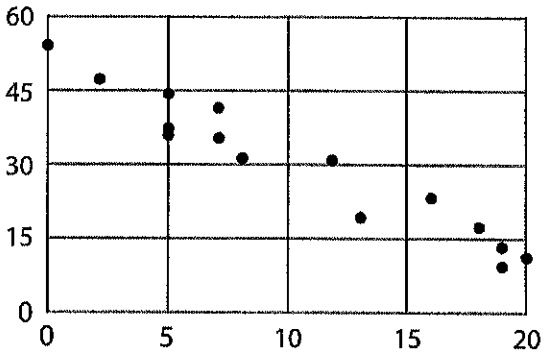
# Unit 6, Lesson 6
# Practice Problems

1. Which of these statements is true about the data in the scatter plot?



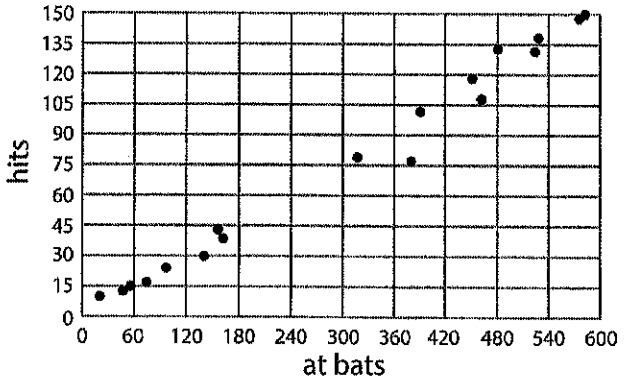

A. As $x$ increases, $y$ tends to increase.

B. As $x$ increases, $y$ tends to decrease.

C. As $x$ increases, $y$ tends to stay unchanged.

D. $x$ and $y$ are unrelated.

2. Here is a scatter plot that compares hits to at bats for players on a baseball team.




Describe the relationship between the number of at bats and the number of hits using the data in the scatter plot.

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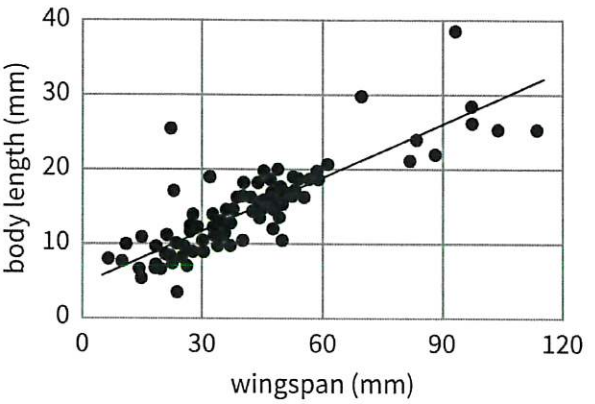
3. The linear model for some butterfly data is given by the equation $y = 0.238x + 4.642$. Which of the following best describes the slope of the model?

"Butterfly" by Couleur via Pixabay. Public Domain.



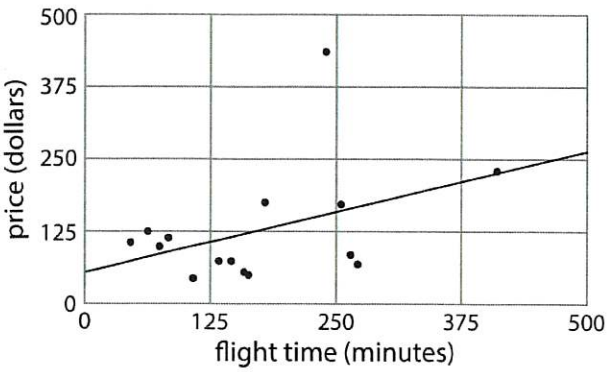

A. For every 1 mm the wingspan increases, the length of the butterfly increases 0.238 mm.

B. For every 1 mm the wingspan increases, the length of the butterfly increases 4.642 mm.

C. For every 1 mm the length of the butterfly increases, the wingspan increases 0.238 mm.

D. For every 1 mm the length of the butterfly increases, the wingspan increases 4.642 mm.

4. Nonstop, one-way flight times from O'Hare Airport in Chicago and prices of a one-way ticket are shown in the scatter plot.




a. Circle any data that appear to be outliers.

b. Use the graph to estimate the difference between any outliers and their predicted values.

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5. Solve: $\begin{cases} y = -3x + 13 \\ y = -2x + 1 \end{cases}$

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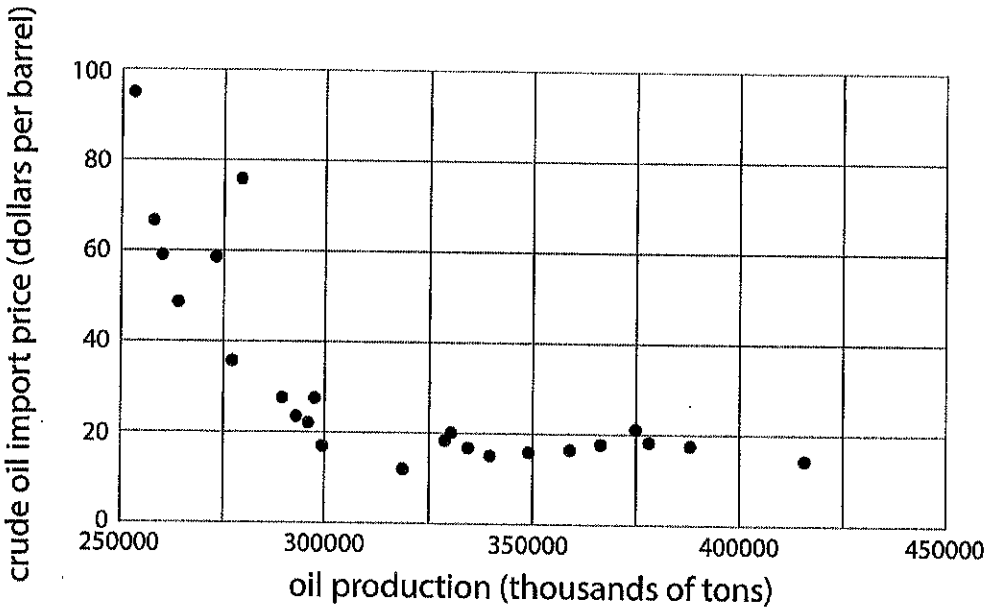
Unit 6, Lesson 7

# Observing More Patterns in Scatter Plots

Let's look for other patterns in data.

## 7.1 Notice and Wonder: Nonlinear Scatter Plot

What do you notice? What do you wonder?




## 7.2 Scatter Plot City

Your teacher will give you a set of cards. Each card shows a scatter plot.

1. Sort the cards into categories and describe each category.

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2. Explain the reasoning behind your categories to your partner. Listen to your partner's reasoning for their categories.

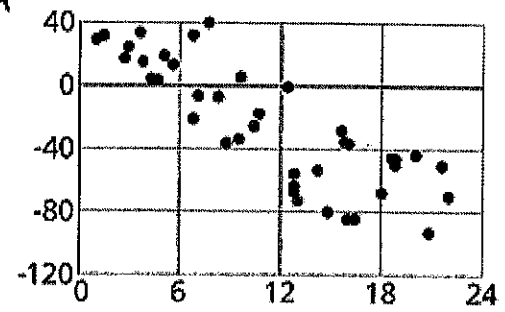
3. Sort the cards into two categories: positive associations and negative associations. Compare your sorting with your partner's and discuss any disagreements.

4. Sort the cards into two categories: linear associations and non-linear associations. Compare your sorting with your partner's and discuss any disagreements.

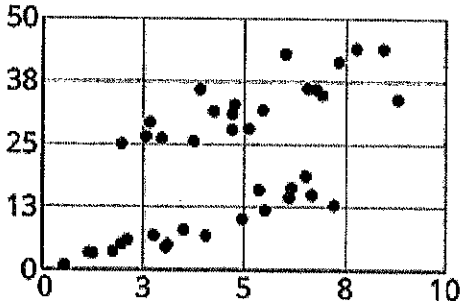
# 7.3 Clustering

How are these scatter plots alike? How are they different?

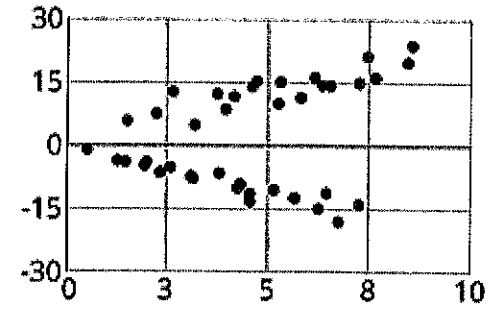
A



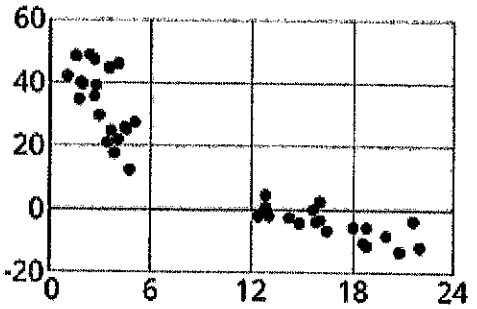

B




C




D



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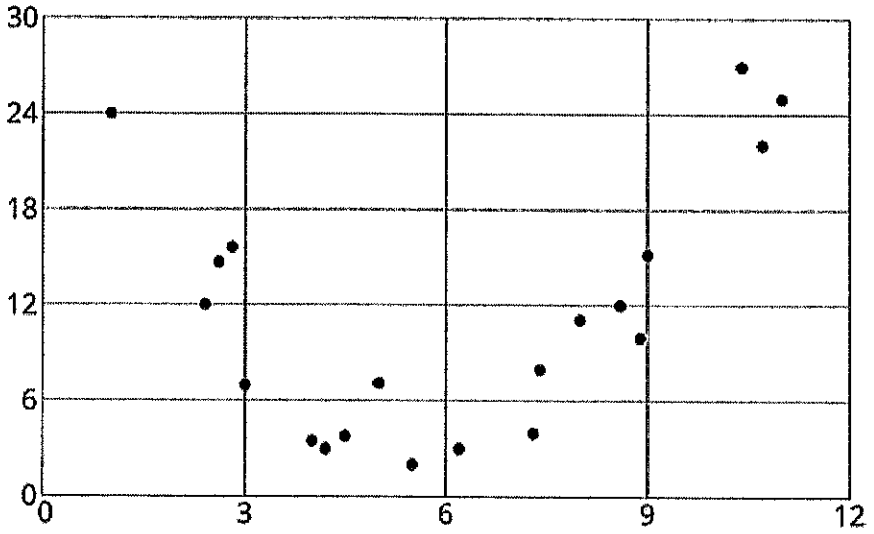
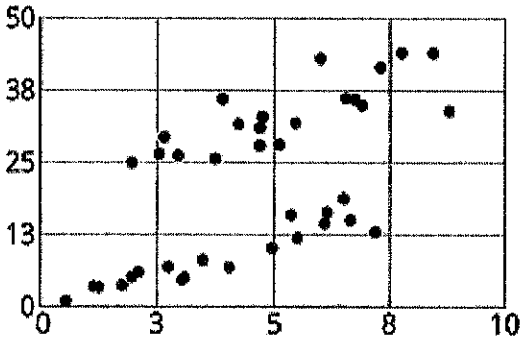
# Lesson 7 Summary

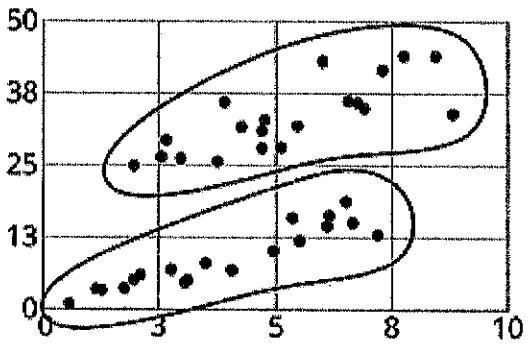
Sometimes a scatter plot shows an association that is *not* linear:




We call such an association a *non-linear association*. In later grades, you will study functions that can be models for non-linear associations.

Sometimes in a scatter plot we can see separate groups of points.




We call these groups *clusters*.

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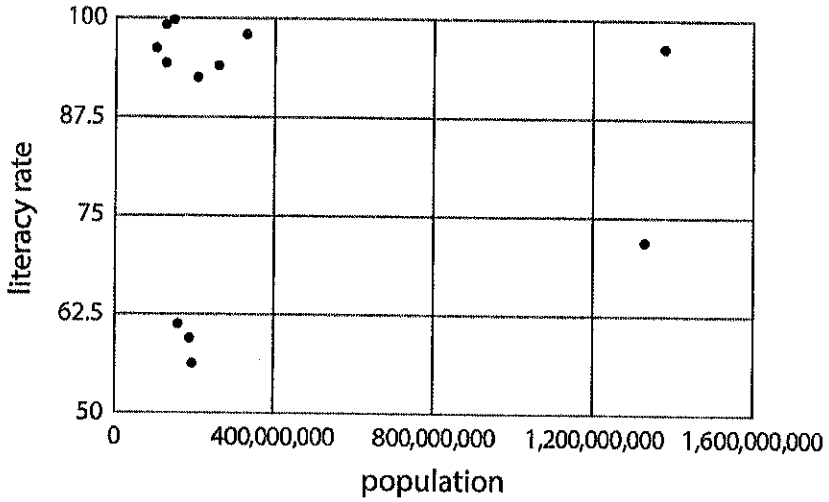
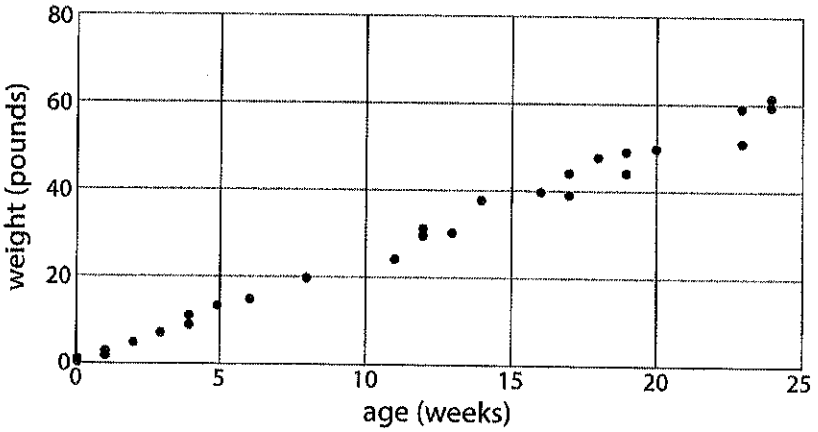
# Unit 6, Lesson 7
# Practice Problems

1. Literacy rate and population for the 12 countries with more than 100 million people are shown in the scatter plot. Circle any clusters in the data.




2. Here is a scatter plot:




Select **all** the following that describe the association in the scatter plot:

A. Linear association

B. Non-linear association

C. Positive association

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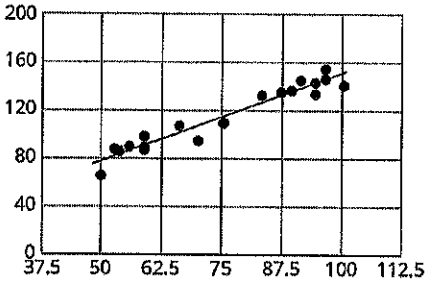
D. Negative association

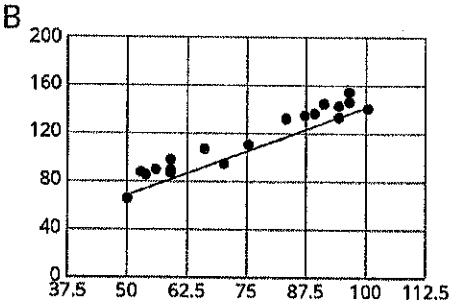
E. No association

3. For the same data, two different models are graphed. Which model more closely matches the data? Explain your reasoning.

A




B

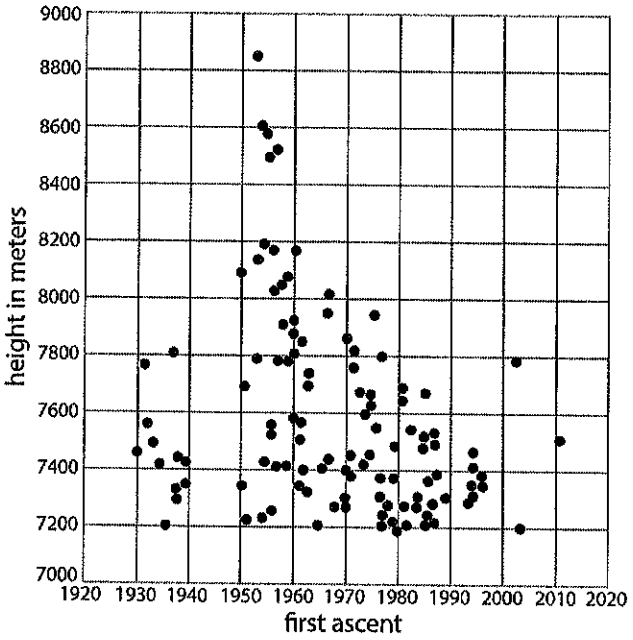



4. Here is a scatter plot of data for some of the tallest mountains on Earth.

The heights in meters and year of first recorded ascent is shown. Mount Everest is the tallest mountain in this set of data.

a. Estimate the height of Mount Everest.

b. Estimate the year of the first recorded ascent of Mount Everest.



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5. A cone has a volume $V$, radius $r$, and a height of 12 cm.

   a. A cone has the same height and $\frac{1}{3}$ of the radius of the original cone. Write an expression for its volume.

   b. A cone has the same height and 3 times the radius of the original cone. Write an expression for its volume.

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Unit 6, Lesson 8

# Analyzing Bivariate Data

Let's analyze data like a pro.

## 8.1 Speed vs. Step Length

A researcher found an association between a dog's stride length and its speed: the longer a dog's steps, the faster it goes. The predicted speed in meters per second, $s$, as a function of step length in meters, $l$, is

$$s = 4l - 1.6$$

What does the rate of change of the function tell you about the association between stride length and speed?

## 8.2 Animal Brains

**Interactive digital version available**

a.openup.org/ms-math/en/s/ccss-8-6-8-2

Is there an association between the weight of an animal's body and the weight of the animal's brain?

Use the data in the table to make a scatter plot. Are there any outliers?

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| animal | body weight (kg) | brain weight (g) |
|---|---|---|
| **cow** | 465 | 423 |
| **grey wolf** | 36 | 120 |
| **goat** | 28 | 115 |
| **donkey** | 187 | 419 |
| **horse** | 521 | 655 |
| **potar monkey** | 10 | 115 |
| **cat** | 3 | 26 |
| **giraffe** | 529 | 680 |
| **gorilla** | 207 | 406 |
| **human** | 62 | 1,320 |
| **rhesus monkey** | 7 | 179 |
| **kangaroo** | 35 | 56 |
| **sheep** | 56 | 175 |
| **jaguar** | 100 | 157 |
| **chimpanzee** | 52 | 440 |
| **pig** | 192 | 180 |

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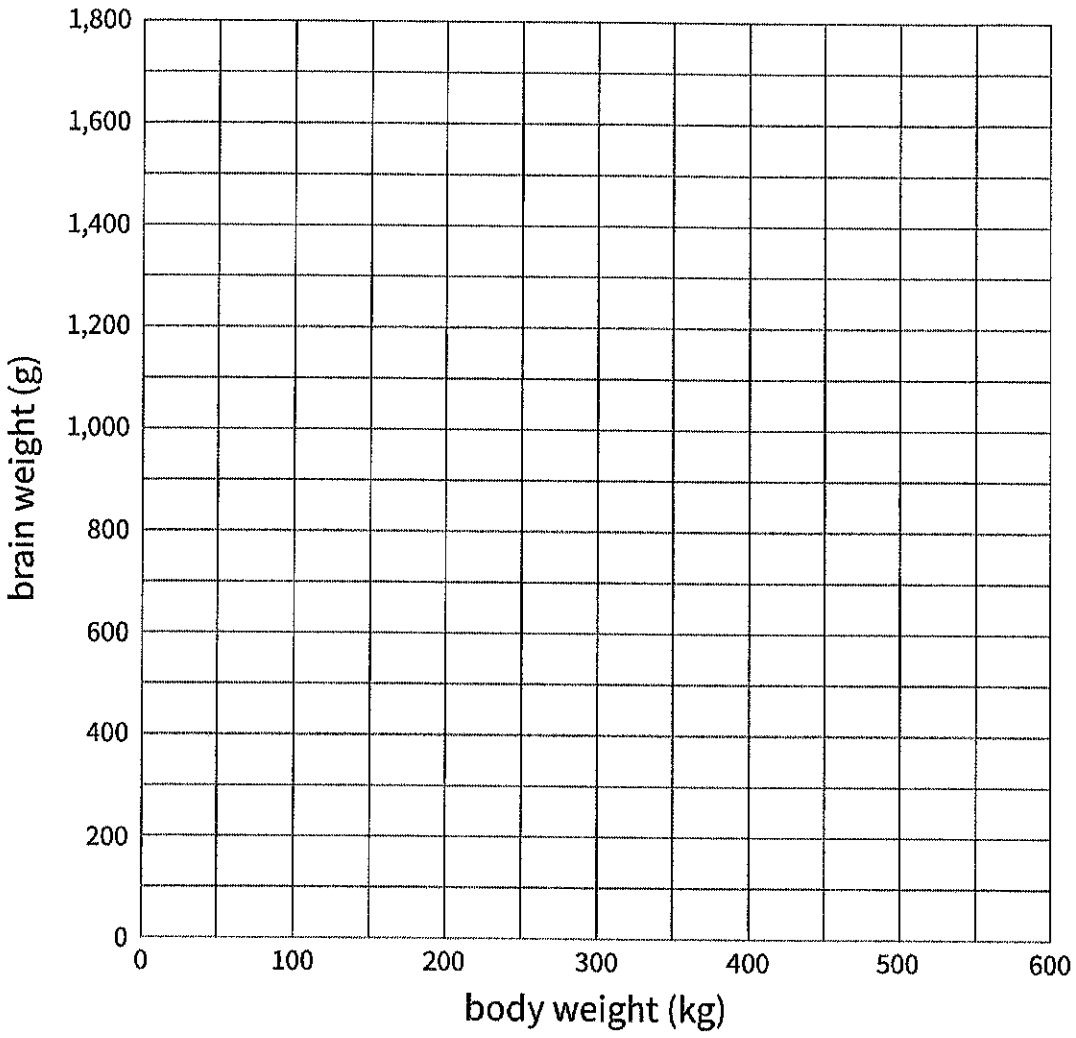


1. After removing the outliers, does there appear to be an association between body weight and brain weight? Describe the association in a sentence.

2. Using a piece of pasta and a straightedge, fit a line to your scatter plot, and estimate its slope. What does this slope mean in the context of brain and body weight?

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3. Does the fitted line help you identify more outliers?

## Are you ready for more?

Use one of the suggestions or find another set of data that interested you to look for associations between the variables.

- Number of wins vs number of points per game for your favorite sports team in different seasons
- Amount of money grossed vs critic rating for your favorite movies
- Price of a ticket vs stadium capacity for popular bands on tour

After you have collected the data,

1. Create a scatter plot for the data.
2. Are any of the points very far away from the rest of the data?
3. Would a linear model fit the data in your scatter plot? If so, draw it. If not, explain why a line would be a bad fit.
4. Is there an association between the two variables? Explain your reasoning.

# 8.3 Equal Body Dimensions (Optional Activity)

**Interactive digital version available**

a.openup.org/ms-math/en/s/ccss-8-6-8-3

Earlier, your class gathered data on height and arm span.

1. Sometimes a person's arm span is the same as their height. Is this true for anyone in the class?

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2. Make a scatter plot for the arm span and height data, and describe any association.

3. Is the line $y = x$ a good fit for the data? If so, explain why. If not, find the equation of a line that fits the data better.

4. Examine the scatter plot. Which person in your class has the *largest* ratio between their arm span and their height? Explain or show your reasoning.

## Lesson 8 Summary

People often collect data in two variables to investigate possible associations between two numerical variables and use the connections that they find to predict more values of the variables. Data analysis usually follows these steps:

1. Collect data.
2. Organize and represent the data, and look for an association.
3. Identify any outliers and try to explain why these data points are exceptions to the trend that describes the association.
4. Find a function that fits the data well.

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Although computational systems can help with data analysis by graphing the data, finding a function that might fit the data, and using that function to make predictions, it is important to understand the process and think about what is happening. A computational system may find a function that does not make sense or use a line when the situation suggests that a different model would be more appropriate.

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# Unit 6, Lesson 8
# Practice Problems

1. Different stores across the country sell a book for different prices. The table shows the price of the book in dollars and the number of books sold at that price.

| price in dollars | number sold |
|---|---|
| 11.25 | 53 |
| 10.50 | 60 |
| 12.10 | 30 |
| 8.45 | 81 |
| 9.25 | 70 |
| 9.75 | 80 |
| 7.25 | 120 |
| 12 | 37 |
| 9.99 | 130 |
| 7.99 | 100 |
| 8.75 | 90 |

   a. Draw a scatter plot of this data. Label the axes.

   b. Are there any outliers? Explain your reasoning.

   c. If there is a relationship between the variables, explain what it is.

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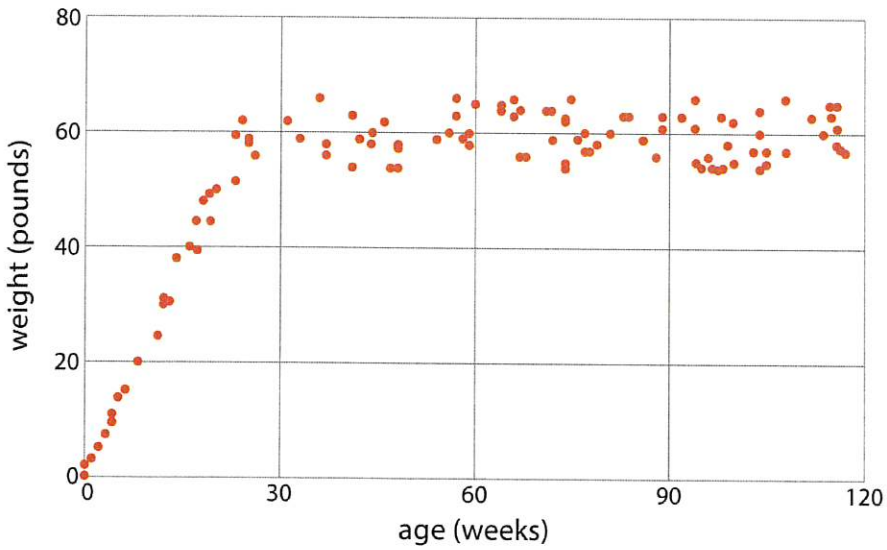
d. Remove any outliers, and draw a line that you think is a good fit for the data.

2. Here is a scatter plot:




Select **all** the following that describe the association in the scatter plot:

A. Linear association

B. Non-linear association

C. Positive association

D. Negative association

E. No association

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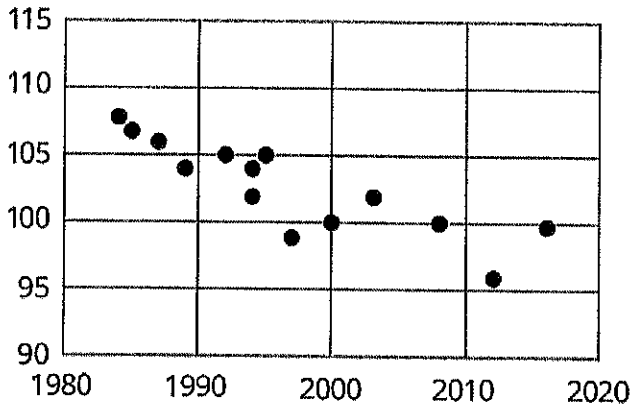
3. Using the data in the scatter plot, what can you tell about the slope of a good model?




A. The slope is positive.

B. The slope is zero.

C. The slope is negative.

D. There is no association.

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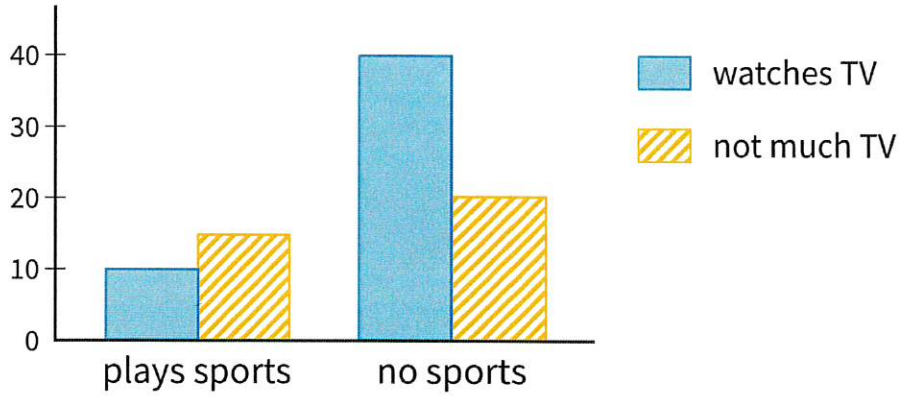
Unit 6, Lesson 9

# Looking for Associations

Let's look for associations in data.

## 9.1 Notice and Wonder: Bar Association

What do you notice? What do you wonder?




## ~~9.2 Matching Representations Card Sort~~

Your teacher will hand out some cards.

Some cards show **two-way tables** like this:

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# 9.3 Building Another Type of Two-Way Table

Here is a two-way table that shows data about cell phone usage among children aged 10 to 18.

| | has cell phone | does not have cell phone | total |
|---|---|---|---|
| **10 to 12 years old** | 25 | 35 | 60 |
| **13 to 15 years old** | 40 | 10 | 50 |
| **16 to 18 years old** | 50 | 10 | 60 |
| **total** | 115 | 55 | 170 |

1. Complete the table. In each row, the entries for "has cell phone" and "does not have cell phone" should have the total 100%. Round entries to the nearest percentage point.

| | has cell phone | does not have cell phone | total |
|---|---|---|---|
| **10 to 12 years old** | 42% | | |
| **13 to 15 years old** | | | 100% |
| **16 to 18 years old** | | 17% | |

This is still a two-way table. Instead of showing *frequency*, this table shows **relative frequency**.

2. Two-way tables that show relative frequencies often don't include a "total" row at the bottom. Why?

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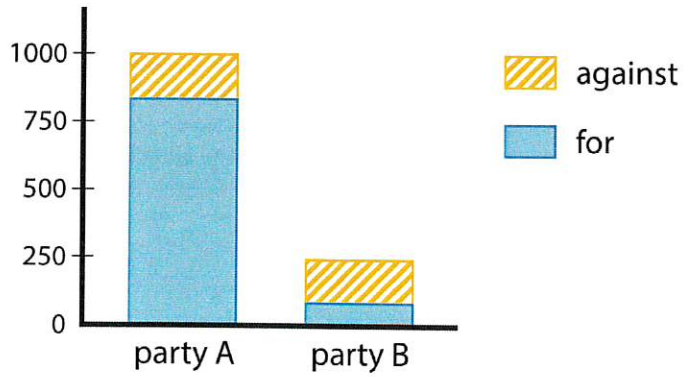
3. Is there an association between age and cell phone use? How does the two-way table of relative frequencies help to illustrate this?

## Are you ready for more?

A pollster attends a rally and surveys many of the participants about whether they associate with political Party A or political Party B and whether they are for or against Proposition 3.14 going up for vote soon. The results are sorted into the table shown.

| | for | against |
|---|---|---|
| **party A** | 832 | 165 |
| **party B** | 80 | 160 |

- A news station reports these results by saying, "A poll shows that about the same number of people from both parties are voting against Proposition 3.14."
- A second news station shows this graphic.




1. Are any of the news reports misleading? Explain your reasoning.

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2. Create a headline, graphic, and short description that more accurately represents the data in the table.

## Lesson 9 Summary

When we collect data by counting things in various categories, like red, blue, or yellow, we call the data *categorical data*, and we say that color is a *categorical variable*.

We can use **two-way tables** to investigate possible connections between two categorical variables. For example, this two-way table of frequencies shows the results of a study of meditation and state of mind of athletes before a track meet.

| | **meditated** | **did not meditate** | **total** |
|---|---|---|---|
| **calm** | 45 | 8 | 53 |
| **agitated** | 23 | 21 | 44 |
| **total** | 68 | 29 | 97 |

If we are interested in the question of whether there is an association between meditating and being calm, we might present the frequencies in a bar graph, grouping data about meditators and grouping data about non-meditators, so we can compare the numbers of calm and agitated athletes in each group.

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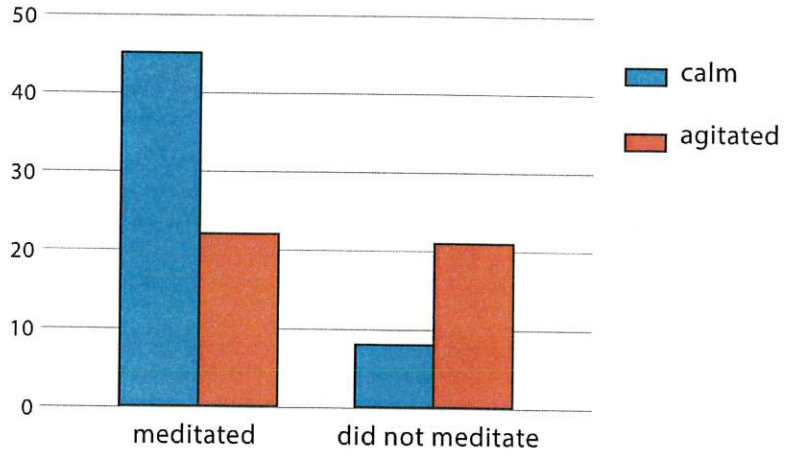


Notice that the number of athletes who did not meditate is small compared to the number who meditated (29 as compared to 68, as shown in the table).
If we want to know the proportions of calm meditators and calm non-meditators, we can make a two-way table of **relative frequencies** and present the relative frequencies in a **segmented bar graph.**

| | **meditated** | **did not meditate** |
|---|---|---|
| **calm** | 66% | 28% |
| **agitated** | 34% | 72% |
| **total** | 100% | 100% |

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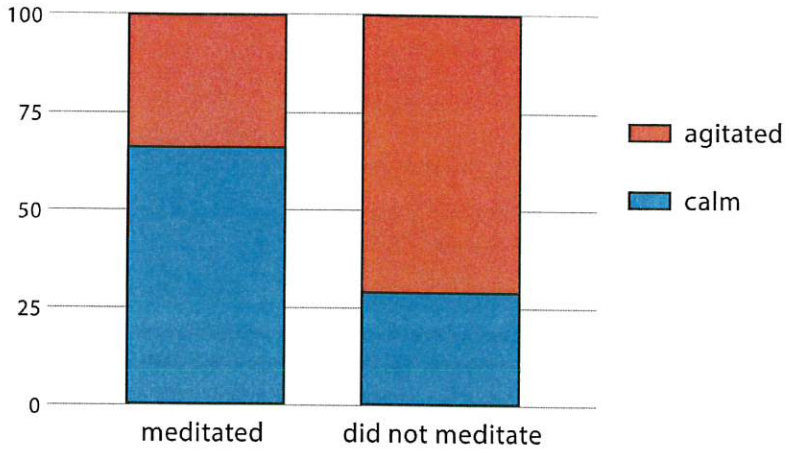


## Glossary Terms

relative frequency

segmented bar graph

two-way table

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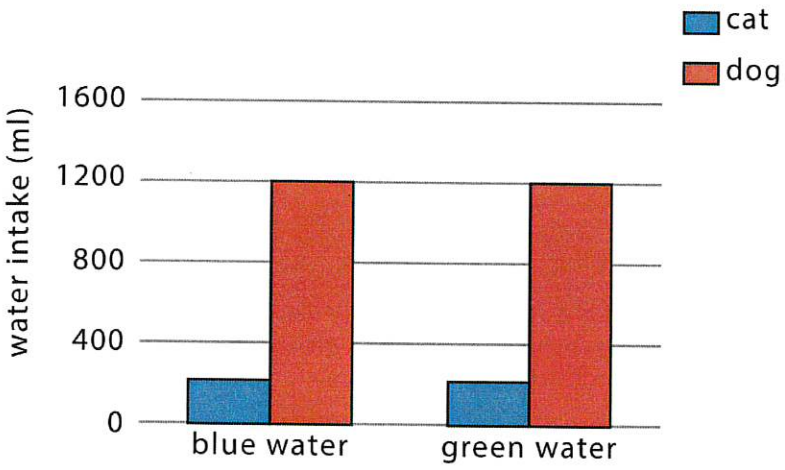
# Unit 6, Lesson 9
# Practice Problems

1. A scientist wants to know if the color of the water affects how much animals drink. The average amount of water each animal drinks was recorded in milliliters for a week and then graphed. Is there evidence to suggest an association between water color and animal?

| | cat intake (ml) | dog intake (ml) | total (ml) |
|---|---|---|---|
| **blue water** | 210 | 1200 | 1410 |
| **green water** | 200 | 1100 | 1300 |
| **total** | 410 | 2300 | 2710 |




2. A farmer brings his produce to the farmer's market and records whether people buy lettuce, apples, both, or something else.

| | bought apples | did not buy apples |
|---|---|---|
| **bought lettuce** | 14 | 58 |

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| | bought apples | did not buy apples |
|---|---|---|
| **did not buy lettuce** | 8 | 29 |

Make a table that shows the relative frequencies for each row. Use this table to decide if there is an association between buying lettuce and buying apples.

3. Researchers at a media company want to study news-reading habits among different age groups. They tracked print and online subscription data and made a 2-way table.

| | internet articles | print articles |
|---|---|---|
| **18–25 year olds** | 151 | 28 |
| **26–45 year olds** | 132 | 72 |
| **45–65 year olds** | 48 | 165 |

a. Create a segmented bar graph using one bar for each row of the table.

b. Is there an association between age groups and the method they use to read articles? Explain your reasoning.

4. Using the data in the scatter plot, what is a reasonable slope of a model that fits this data?

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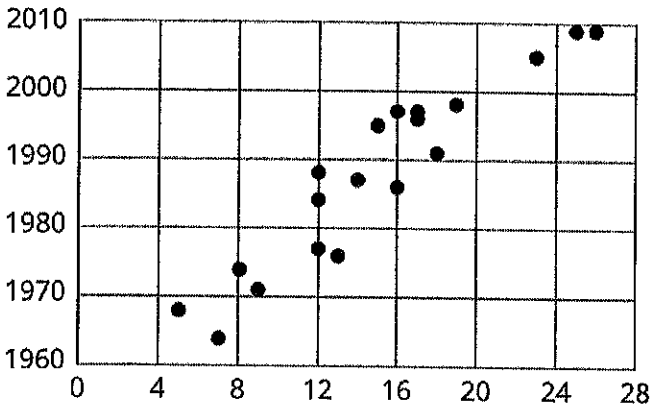


A. -2.5

B. -1

C. 1

D. 2.5

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Unit 6, Lesson 10

# Using Data Displays to Find Associations

Let's use data displays to find associations.

## 10.1 Sports and Musical Instruments

For a survey, students in a class answered these questions:

- Do you play a sport?
- Do you play a musical instrument?

1. Here is a two-way table that gives some results from the survey. Complete the table, assuming that all students answered both questions.

| | **plays instrument** | **does not play instrument** | **total** |
|---|---|---|---|
| **plays sport** | 5 | | 16 |
| **does not play sport** | | | |
| **total** | | 15 | 25 |

2. To the nearest percentage point, what percentage of students who play a sport *don't* play a musical instrument?

3. To the nearest percentage point, what percentage of students who *don't* play a sport also *don't* play a musical instrument?

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# 10.2 Sports and Music Association

Your teacher will give you a two-way table with information about the number of people in your class who play sports or musical instruments.

1. Complete this table to make a two-way table for the data from earlier. The table will show relative frequencies *by row*.

| | **plays instrument** | **does not play instrument** | **row total** |
|---|---|---|---|
| **plays sport** | | | 100% |
| **does not play sport** | | | 100% |

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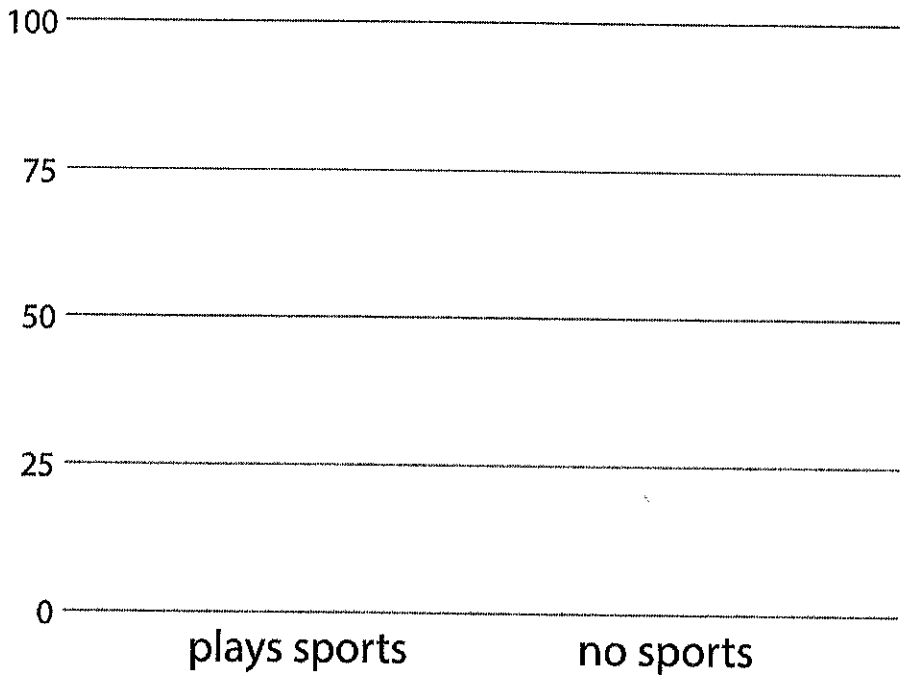
2. Make a segmented bar graph for the table. Use one bar of the graph for each row of the table.




3. Complete the table to make a two-way table for the data from earlier. The table will show relative frequencies *by column*.

| | **plays instrument** | **does not play instrument** |
|---|---|---|
| **plays sport** | | |
| **does not play sport** | | |
| **column total** | 100% | 100% |

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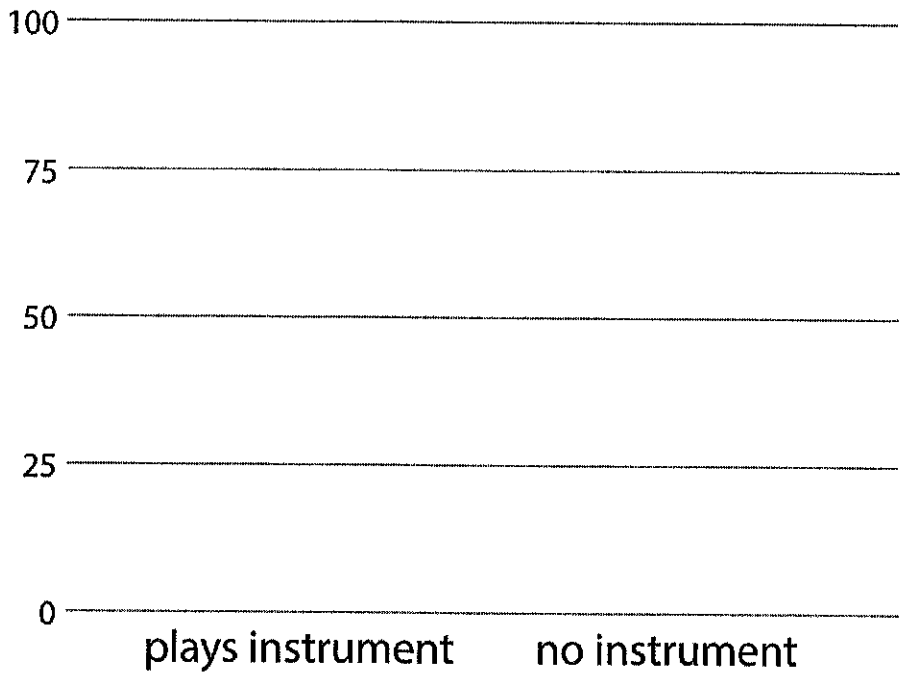
4. Using the values in the table, make a segmented bar graph. Use one bar of the graph for each column of the table.




5. Based on the two-way tables and segmented bar graphs, do you think there is an association between playing a sport and playing a musical instrument? Explain how you know.

# 10.3 Colored Erasers

An eraser factory has five machines. One machine makes the eraser shapes. Then each shape goes through the red machine, blue machine, yellow machine, or green machine to have a side colored.

The manager notices that an uncolored side of some erasers is flawed at the end of the process and wants to know which machine needs to be fixed: the shape machine or some

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of the color machines. The manager collected data on the number of flawed and unflawed erasers of each color.

| | unflawed | flawed | total |
|---|---|---|---|
| **red** | 285 | 15 | 300 |
| **blue** | 223 | 17 | 240 |
| **yellow** | 120 | 80 | 200 |
| **green** | 195 | 65 | 260 |
| **total** | 823 | 177 | 1000 |

1. Work with a partner. Each of you should make one segmented bar graph for the data in the table. One segmented bar graph should have a bar for each *row* of the table. The other segmented bar graph should have one bar for each *column* of the table.

2. Are the flawed erasers associated with certain colors? If so, which colors? Explain your reasoning.

## Are you ready for more?

Based on the federal budgets for 2009, the table shows where some of the federal money was expected to go. The values are in billions of U.S. Dollars.

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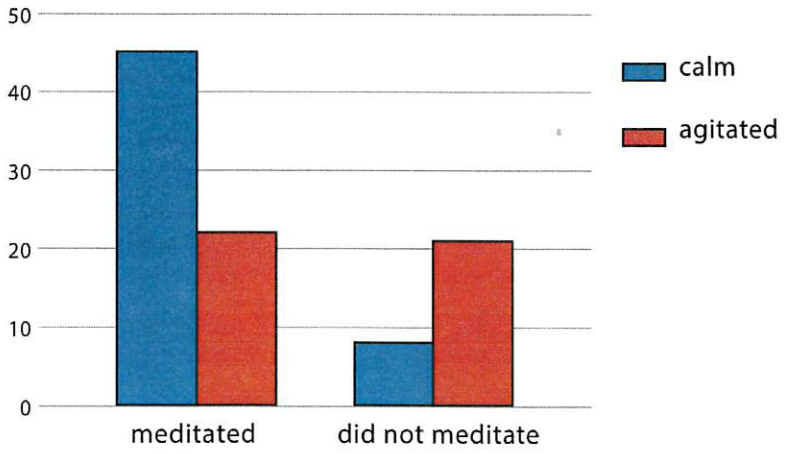
| | United States | Japan | United Kingdom |
|---|---|---|---|
| **defense** | 718.4 | 42.8 | 49.2 |
| **education** | 44.9 | 47.5 | 113.9 |

1. Why would a segmented bar graph be more useful than the table of data to see any associations between the country and where the money is spent?
2. Create a segmented bar graph that represents the data from the table.

3. Is there an association between the country's budget and their spending in these areas? Explain your reasoning.

## Lesson 10 Summary

In an earlier lesson, we looked at data on meditation and state of mind in athletes.



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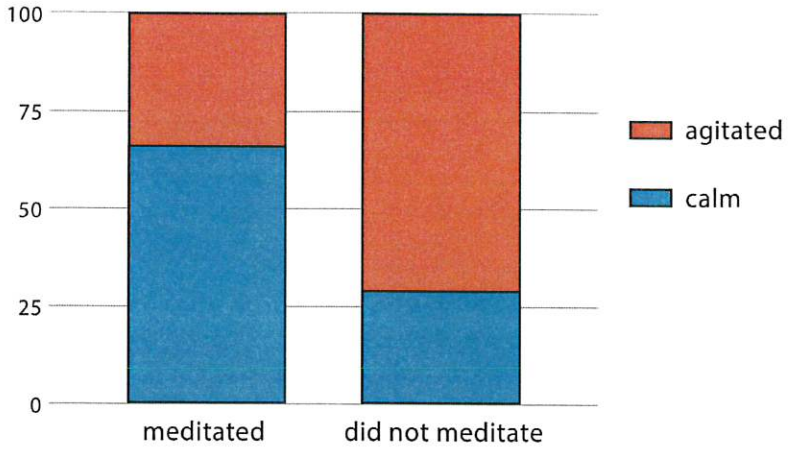


Is there an association between meditation and state of mind?

The bar graph shows that more athletes were calm than agitated among the group that meditated, and more athletes were agitated than calm among the group that did not. We can see the proportions of calm meditators and calm non-meditators from the segmented bar graph, which shows that about 66% of athletes who meditated were calm, whereas only about 27% of those who did not meditate were calm.

This does not necessarily mean that meditation causes calm; it could be the other way around, that calm athletes are more inclined to meditate. But it does suggest that there is an association between meditating and calmness.

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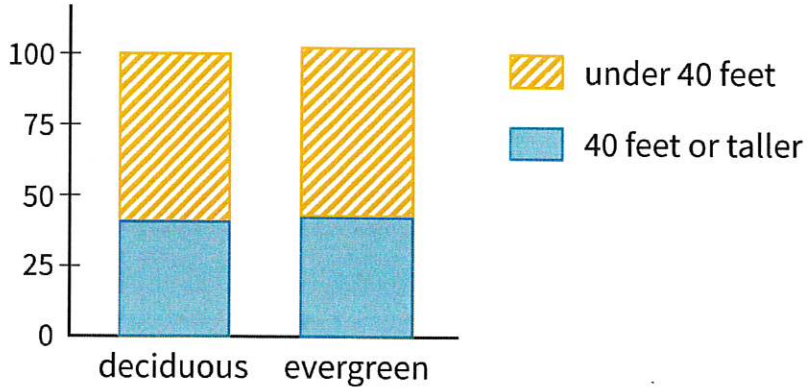
Unit 6, Lesson 10

# Practice Problems

1. An ecologist is studying a forest with a mixture of tree types. Since the average tree height in the area is 40 feet, he measures the height of the tree against that. He also records the type of tree. The results are shown in the table and segmented bar graph. Is there evidence of an association between tree height and tree type? Explain your reasoning.

| | under 40 feet | 40 feet or taller | total |
|---|---|---|---|
| **deciduous** | 45 | 30 | 75 |
| **evergreen** | 14 | 10 | 24 |
| **total** | 59 | 40 | 99 |




2. Workers at an advertising agency are interested in people's TV viewing habits. They take a survey of people in two cities to try to find patterns in the types of shows they watch. The results are recorded in a table and shown in a segmented bar graph. Is there evidence of different viewing habits? If so, explain.

| | reality | news | comedy | drama |
|---|---|---|---|---|
| **Chicago** | 50 | 40 | 90 | 20 |

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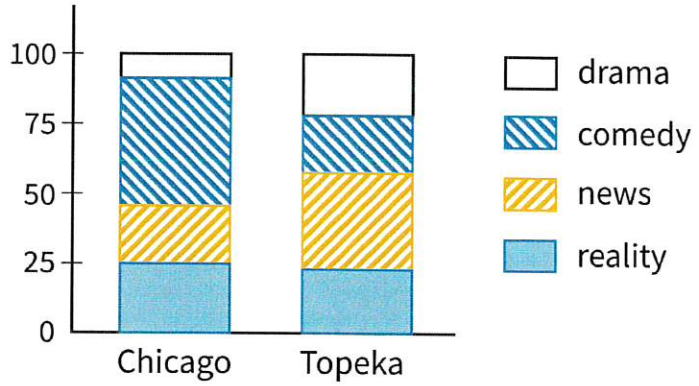
| | reality | news | comedy | drama |
|---|---|---|---|---|
| **Topeka** | 45 | 70 | 40 | 45 |




3. A scientist is interested in whether certain species of butterflies like certain types of local flowers. The scientist captures butterflies in two zones with different flower types and records the number caught. Do these data show an association between butterfly type and zone? Explain your reasoning.

| | zone 1 | zone 2 |
|---|---|---|
| **eastern tiger swallowtail** | 16 | 34 |
| **monarch** | 24 | 46 |

# Unit 6 Practice Assessment

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## ~~Unit 6 End-of-Unit Assessment~~



You may use graph paper and a four-function or scientific calculator, but not a graphing calculator.

1. Noah gathered data at his school among 7th and 8th graders to see if there was an association between grade level and handedness. This table shows his data, but the number of right-handed 8th graders is missing.

| | **left-handed** | **right-handed** |
|---|---|---|
| **7th grade** | 11 | 72 |
| **8th grade** | 24 | |

Noah found there was *no evidence* of an association between grade level and handedness. Which of these could be the number of right-handed 8th graders?

A. 33

B. 85

C. 107

D. 157

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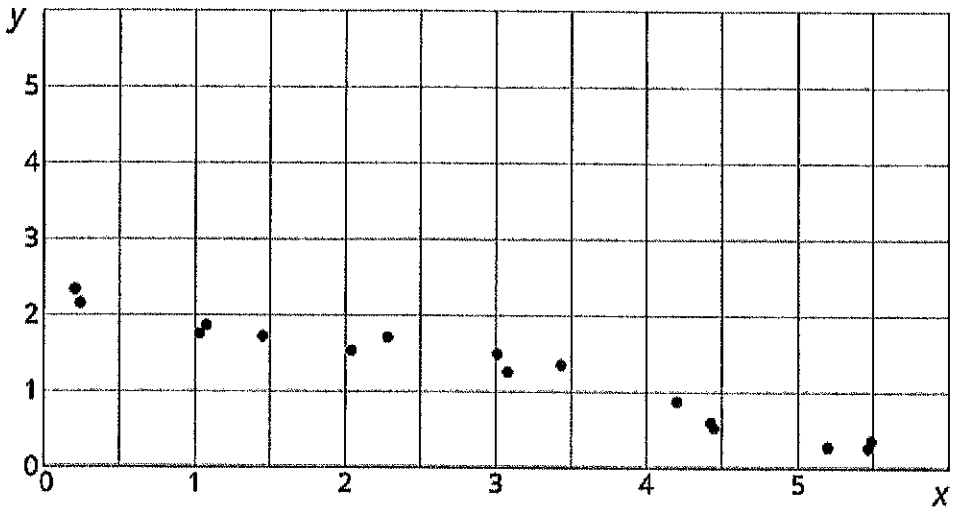
2. Here is a scatter plot:




The graph of what linear equation is a good fit for this data?

A. $y = \frac{-1}{3}x + 2$

B. $y = \frac{-1}{3}x + 6$

C. $y = \frac{1}{3}x + 2$

D. $y = \frac{1}{3}x + 6$

3. Select **all** the relationships that demonstrate a positive association between variables.

A. Outside temperature and cost to heat a home

B. Number of people in a grocery check-out line and how long you have to wait to check out

C. Length of time you have walked and distance you have traveled

D. Pounds of cherries you buy and amount of money you spend on cherries

E. Speed of a train and the amount of time it takes for the train to get to its destination

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4. a. Draw a scatter plot that shows a positive, linear association and has one clear outlier. Circle the outlier.

   b. Draw a scatter plot that shows a negative association that is not linear.

5. Jada surveyed all 7th and 8th graders at her school about whether they had pets. Complete the missing entries in this two-way table.

| | **has pet** | **has no pet** | **total** |
|---|---|---|---|
| **7th grade** | 102 | | 150 |
| **8th grade** | | 68 | 175 |
| **total** | | | |

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6. At a school social, parents attended with their children. Everyone had a choice between a sweet snack and a salty snack. Here is a two-way table showing the number of adults and children who made each choice of snack.

| | sweet snack | salty snack | total |
|---|---|---|---|
| **adult** | 57 | 88 | 145 |
| **child** | 77 | 31 | 108 |
| **total** | 134 | 119 | 253 |

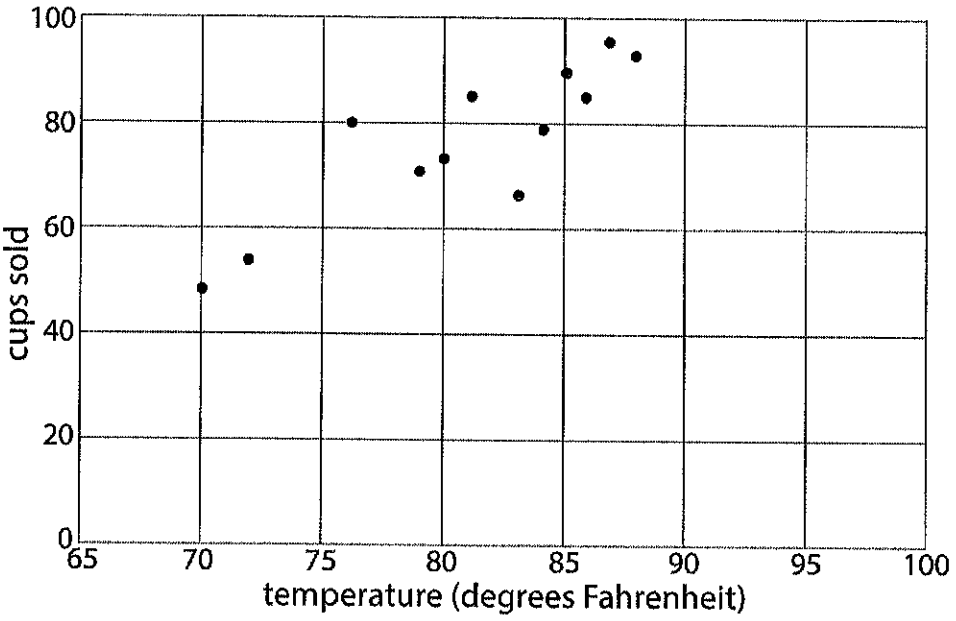
a. Fill in the blanks in the table with relative frequency by row. Round to the nearest percent.

| | sweet snack | salty snack | total |
|---|---|---|---|
| **adult** | | | 100% |
| **child** | | | 100% |

b. Make a segmented bar graph to represent the data in your table. Use one bar for each row of the table.

NAME DATE PERIOD

7. Lin opened a lemonade stand during the summer. She noticed that she sold more lemonade on warmer days. For each day she sold lemonade, she plotted the point $(t, c)$, where $t$ represents high temperature and $c$ represents cups of lemonade sold.




a. On the same axes, draw a line that you think is a good fit for the data.

b. A computer program found that the line $c = 2t - 89$ is a good fit for the data. Use this equation to predict how many cups of lemonade Lin might sell on a day when the high temperature is 74 degrees.

c. The high temperature this Sunday is expected to be 5 degrees warmer than the high temperature this Saturday. Using the line $c = 2t - 89$, how many more cups of

NAME DATE PERIOD

lemonade should Lin expect to sell on Sunday than Saturday? Explain or show your reasoning.

# 8th Grade

| Week of 3/16 | PD Day | Day 1 | |
|---|---|---|---|
| **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) | |
| **Assignment**<br>Read the pages assigned and answer any questions associated | | p. 389<br>p. 462-463 | p. 468-471<br>p. 300-301 |
| **To Be Graded** | | Day 1 Assignment | |

| Week of 3/23 | Day 2 | Day 3 | Day 4 |
|---|---|---|---|
| **Objective** | SWBAT explain how thermal energy transfers | SWBAT review kinetic and potential energy | SWBAT review mechanical energy and energy transfers |
| **Assignment**<br>Read the pages assigned and answer any questions associated | p. 304-307 | p. 282-287 | 288-290<br>294<br>296-297<br>298-299 |
| **To Be Graded** | Day 2 Assignment | See Assignment 3 | Day 3 Assignment |

Updated 3/18/2020

| Week of 3/30 | Day 5 | Day 6 | |
|---|---|---|---|
| **Objective** | SWBAT show knowledge of unit objectives by taking a unit assessment | SWBAT review atoms and molecules | |
| **Assignment**<br>Read the pages assigned and answer any questions associated | In Student Packet 1<br><br>Unit Assessment | In Readings Section<br>p. 85-86<br>p. 89-90 | |
| **To Be Graded** | Unit Assessment | In Assignments Section<br>pages 87-88 & 91-92 | |
| **Week of 4/6** | **Day 7** | **Day 8** | **Day 9** |
| **Objective** | SWBAT review the theory of continental drift, evidence for it and how seafloor spreading contributed to it | SWBAT review the law of superposition, fossils and how they tell relative geologic time | **No Instruction Thursday/Friday Spring Break 4/9-4/13** |
| **Assignment**<br>Read the pages assigned and answer any questions associated | In Readings Section<br>p. 164-173 | In Readings Section<br>p. 240-241<br>p. 244-251 | |
| **To Be Graded** | Day 7 Assignment<br>In Assignments Section<br>p. 1-4 | Day 8 Assignment<br>In Assignments Section<br>p. 5-9 | |

Updated 3/18/2020

# READINGS

# What Are Elements?

## Elements and Atoms

All matter is made up of elements, substances that cannot be broken apart into other substances. An atom is the smallest particle of an element that still has the properties of that element. Atoms are too small to be seen with a light microscope.

## Organization of Atoms

Atoms contain negatively charged particles called electrons. Atoms also have a small core in the middle called the nucleus. Electrons move quickly around the nucleus, which is made of particles called protons and neutrons. Protons have a positive charge. Neutrons have no charge. The number of protons in an atom is usually the same as the number of electrons.

Atoms of a certain element all have the same number of protons in the nucleus, but the number of neutrons may vary.

Carbon is found in nature in many forms with different properties. This happens because carbon atoms can be put together in many different ways. Graphite, the "lead" in most pencils, is a form of carbon. The carbon atoms are grouped in rings of six atoms each.

Diamond is another form of pure carbon. It is the hardest natural substance on Earth because the carbon atoms are packed tightly together. No matter what form it takes, the element carbon is made up of atoms that all have the same number of protons.

## Elements Alone and Joined

Most atoms join with other atoms to form molecules. A molecule is two or more atoms joined together by forces called chemical bonds. In a molecule, the atoms in some ways act together as one part. Some molecules are made up of one or more than one element. The oxygen in the air you breathe has two oxygen atoms. A molecule of water has two hydrogen atoms and one oxygen atom.

An element's properties come from the atoms that make up that element. Some properties are color, hardness, and density. The element copper is a shiny metal that can be stretched into wires. The element silver is a shiny metal that is soft enough to be formed into things like bracelets and rings. The element helium in balloons is less dense than air, causing the balloons to float. The element aluminum is a shiny metal. It is strong, but it does not weigh very much.

## The Periodic Table

Scientists have named more than 100 elements. The elements are organized, or sorted out, in the periodic table.

Long ago, people in ancient Greece put forth the idea that all matter is made up of four elements: earth, air, fire, and water. But people began to understand that there must be more than just those four elements.

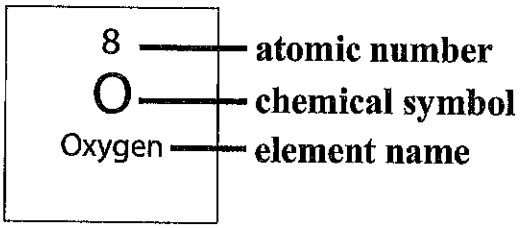
In the 1600s, an English scientist said that earth, air, fire, and water could not be real elements. In the late 1700s, a French scientist made one of the first lists of chemical elements.

By the 1800s, scientists had begun to name many new elements. They were also learning that some elements had properties that were alike. They began to organize elements into families, or groups, with properties that were alike. However, not all scientists grouped elements in the same way.

In 1869, Russian scientist Dmitri Mendeleev came up with a way to list and group the elements. He listed elements with similar properties together.

Today, scientists use a table called the periodic table. It is much like Mendeleev's table. It is called the periodic table because properties of the elements have a repeating pattern. *Periodic* means "repeating."

In the periodic table, elements are listed in order of increasing atomic number. This number tells how many protons are in an element's nucleus. The box for each element lists the atomic number, chemical symbol, and name. The chemical symbol is a shorter form of the element's name.




## Classification of Elements

Colors on the periodic table show whether elements are metals, nonmetals, or metalloids. Metals are shiny, can be bent or stretched, and conduct electricity. Most elements are metals. Many nonmetals are gases. Solid nonmetals are usually dull in color. They do not conduct electricity, bend, or stretch very much. They break easily. Metalloids are like both metals and nonmetals.

# What Are Compounds?

## Combining Elements

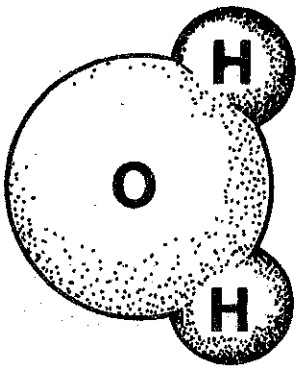
When two or more elements are chemically joined, they form a compound. Compounds, like elements, are pure substances. They have different properties from the elements that make them. In many compounds, atoms come together to form molecules. Each molecule of a compound has the same chemical properties.

At one time, people thought water was an element. However, an element cannot be broken down into other substances. Scientists figured out that water is not an element when they broke it down into other substances.

Water is a compound made of the elements hydrogen and oxygen. A compound is a substance made up of two or more elements that are chemically joined. Every molecule of water has two hydrogen atoms and one oxygen atom.

A compound has its own chemical properties. In many compounds, atoms come together to form molecules. Each molecule of a compound acts in the exact same way. They all have the same chemical properties.

All water molecules are made up of two hydrogen atoms and one oxygen atom. Every molecule of water has the properties of water. These properties are different from the properties of hydrogen and oxygen.




**water molecule**

## Many Compounds

Many compounds are found in nature, and many are made of two elements. When you breathe out, your breath contains a compound called carbon dioxide. Molecules of carbon dioxide are made up of one carbon atom and two oxygen atoms.

Rust is a compound called iron oxide. It is made of iron and oxygen. When iron joins with oxygen in the air, rust forms. Water makes this change happen even faster.

## Making and Breaking Compounds

To form a compound, atoms of the elements in the compound must take part in a chemical reaction. A chemical reaction is a process in which one or more substances are changed into one or more different substances.

Energy is an important part of all chemical reactions. Energy is needed to break apart compounds. When elements join to form compounds, energy is let go.

## Compounds and Formulas

A chemical formula is a short way to describe a chemical compound. Chemical formulas use chemical symbols to show which elements are in a compound. For example, the chemical symbol for iron is Fe. The chemical symbol for sulfur is S. The chemical formula for iron sulfide is FeS. There is one iron atom for every sulfur atom.

Often a compound has more of one element than another element. A number in the chemical formula tells you how many atoms of that element are in the compound. The chemical formula for water is $H_2O$. This means that there are two hydrogen atoms for every one oxygen atom.

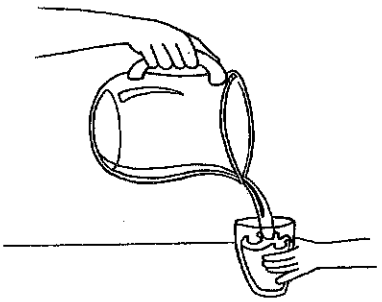
## Water

Water is everywhere on Earth. About three-fourths of Earth's surface is covered with water. All forms of life depend on water to live.

Water is different from other compounds. It is one of the few compounds that is liquid at room temperature. It is also able to dissolve, or break down, more substances than any other liquid.

One reason water has these properties is because of the shape of its molecules. Water molecules have a bent shape. This gives the oxygen end of the molecule a bit of a negative charge and the hydrogen end a bit of a positive charge. These differences make water able to dissolve many compounds.

The charges also draw the hydrogen and oxygen ends of different water molecules together. This is why water is a liquid at many temperatures.



Louisiana

LESSON 1

# Drifting Continents

UNLOCK THE BIG ?

## What Was Wegener's Hypothesis About the Continents?

GLE 35, 36 (SI-M-B5); 9 (ESS-M-A2)

## MY PLANET DIARY

### A Puzzled Look

Scientists have long noticed that Earth's continents look as though they could fit together like pieces of a jigsaw puzzle. This was an idea that Alfred Wegener suggested in 1910. "Doesn't the east coast of South America fit exactly against the west coast of Africa, as if they had once been joined?" he asked. "This is an idea I'll have to pursue."

## VOICES FROM HISTORY

**Communicate** Discuss Wegener's idea with a partner. Then answer the questions.

1. Why did Wegener think that the continents might once have been joined?

2. If you were Wegener, what other evidence would you look for to show that the continents had once been joined?

PLANET DIARY Go to **Planet Diary** to learn more about the continents.

Lab zone® Do the Inquiry Warm-Up *How Are Earth's Continents Linked Together?*

**Grade 8 Grade Level Expectations**

**GLE 35** Explain how skepticism leads to new understanding. (SI-M-B5)

**GLE 36** Explain why an experiment must be verified before the findings are accepted. (SI-M-B5)

**GLE 9** Explain the development of the theories of plate tectonics. (ESS-M-A2)

## What Was Wegener's Hypothesis About the Continents?

Have you ever looked at a world map and noticed how the coastlines of Africa and South America seem to match up? For many years, scientists made this same observation! In 1910, a German scientist named Alfred Wegener (VAY guh nur) became curious about why some continents look as though they could fit together.

## Vocabulary

- continental drift
- Pangaea
- fossil

## Skills

- Reading: Ask Questions
- Inquiry: Infer

According to Wegener, the continents of Earth had moved. **Wegener's hypothesis was that all the continents were once joined together in a single landmass and have since drifted apart.** Wegener's idea that the continents slowly moved over Earth's surface became known as **continental drift.**

According to Wegener, the continents were joined together in a supercontinent, or single landmass, about 300 million years ago. Wegener called the supercontinent **Pangaea** (pan JEE uh).

Over tens of millions of years, Pangaea began to break apart. The pieces of Pangaea slowly moved to their present locations, shown in **Figure 1.** These pieces became the continents as formed today. In 1915, Wegener published his evidence for continental drift in a book called *The Origin of Continents and Oceans.*

*Pangaea* means "all lands" in Greek. Why is this a suitable name for a supercontinent?

## Evidence From Land Features

Land features on the continents provided Wegener with evidence for his hypothesis. On the next page, **Figure 2** shows some of this evidence. For example, Wegener pieced together maps of Africa and South America. He noticed that mountain ranges on the continents line up. He noticed that coal fields in Europe and North America also match up.

FIGURE 1

### Piecing It All Together

The coastlines of some continents seem to fit together like a jigsaw puzzle.

**Use the map to answer the questions.**

1. **Interpret Maps** Draw an arrow to match the numbered coast with the lettered coast that seems to fit with it.

| | |
|---|---|
| 1 | a |
| 2 | b |
| 3 | c |
| 4 | d |

2. **Infer** How would a continent's climate change if it drifted closer to the equator?

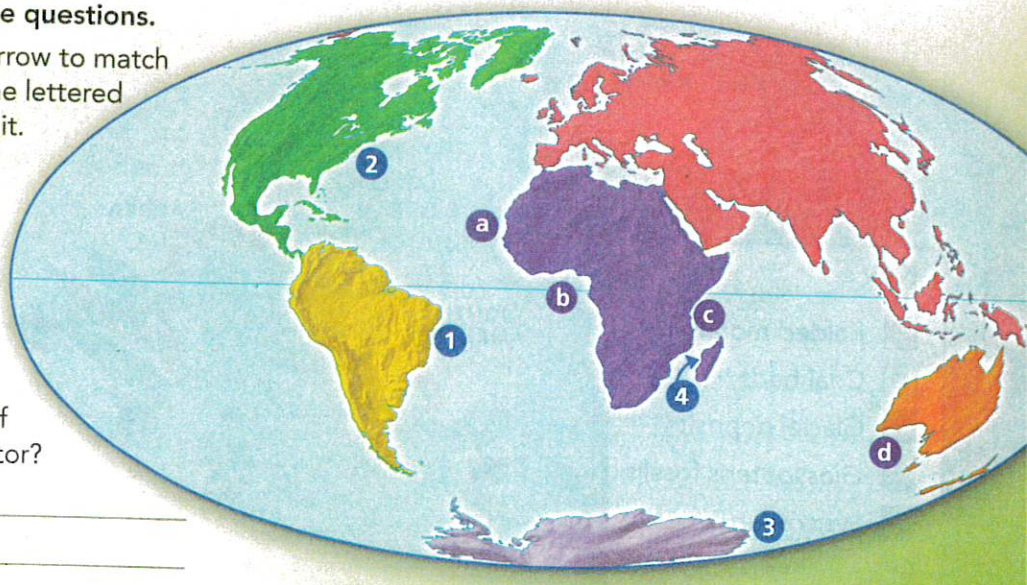


FIGURE 2

**INTERACTIVE ART** **Pangaea and Continental Drift**

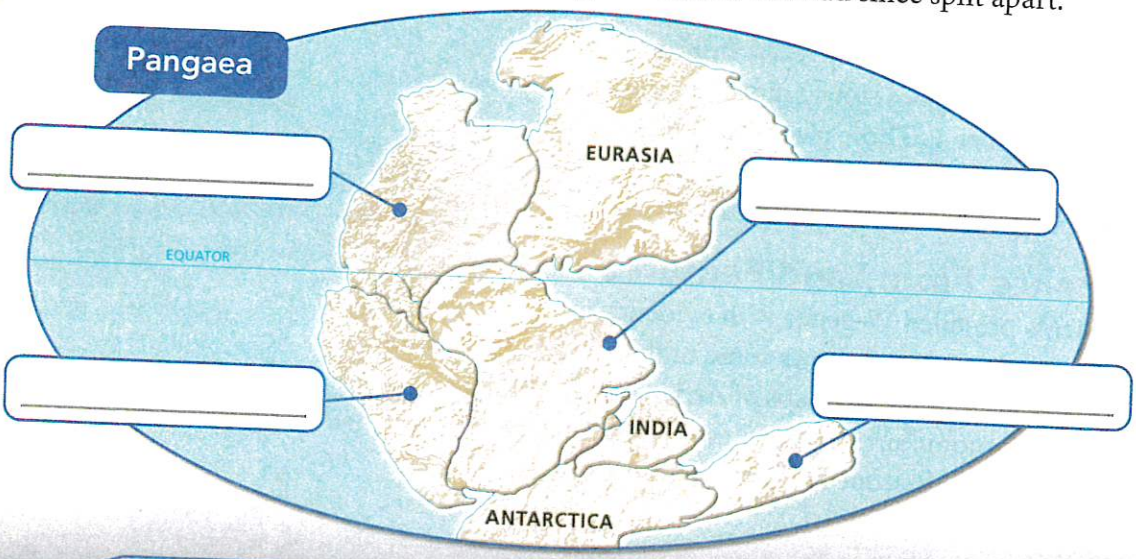
Many types of evidence suggest that Earth's landmasses were once joined together.

**Infer** **On the top map of Pangaea, draw where each piece of evidence on the bottom map would have been found. Use a different symbol or color for each piece of evidence, and provide a key. Then label the continents.**

## Evidence From Fossils

Wegener also used fossils to support his hypothesis for continental drift. A **fossil** is any trace of an ancient organism that has been preserved in rock. For example, *Glossopteris* (glaw SAHP tuh ris) was a fernlike plant that lived 250 million years ago. *Glossopteris* fossils have been found in Africa, South America, Australia, India, and Antarctica, as shown in **Figure 2.** The occurrence of *Glossopteris* on landmasses that are now separated by oceans indicates that Pangaea once existed.

Other examples include fossils of the freshwater reptiles *Mesosaurus* and *Lystrosaurus*. These fossils have also been found in places now separated by oceans. Neither reptile could have swum great distances across salt water. Wegener inferred that these reptiles lived on a single landmass that had since split apart.




## Evidence From Climate

Wegener used evidence of climate change to support his hypothesis. As a continent moves toward the equator, its climate gets warmer. As a continent moves toward the poles, its climate gets colder. In either case, the continent carries along with it the fossils and rocks that formed at all of its previous locations.

For example, fossils of tropical plants are found on Spitsbergen, an island in the Arctic Ocean. When these plants lived about 300 million years ago, the island must have had a warm, mild climate. Wegener said the climate changed because the island moved.

## Wegener's Hypothesis Rejected

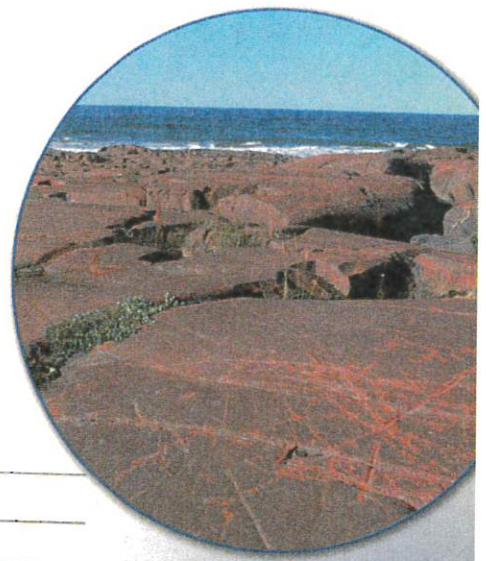
Wegener attempted to explain how continental drift took place. He suggested that the continents plowed across the ocean floors. But Wegener could not provide a satisfactory explanation for the force that pushes or pulls the continents. Because Wegener could not identify the cause of continental drift, most geologists of his time rejected his idea.

**Ask Questions** Write a question relating to climate and Wegener's hypothesis. Read the text and answer your question.

## apply it!

Deep scratches have been found in rocks in South Africa. Such scratches are caused only by glaciers that move across continents. But the climate of South Africa is too mild today for glaciers to form.

1. **Infer** South Africa was once (colder/warmer) than it is today.
2. **CHALLENGE** What can you infer about South Africa's former location?



Lab zone® Do the Quick Lab *Moving the Continents.*

## Assess Your Understanding

**1a. Review** Based on evidence from land features, fossils, and climate, Wegener concluded that continents (sink/rise/move).

GLE 36

**b. Predict** Wegener said that because continents move, they can collide with each other. How could colliding continents explain the formation of mountains?

GLE 9

## got it?

- ○ I get it! Now I know Wegener's hypothesis about the continents stated that _____
- ○ I need extra help with _____

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

GLE 9, 35, 36

Louisiana

LESSON 2

# Sea-Floor Spreading

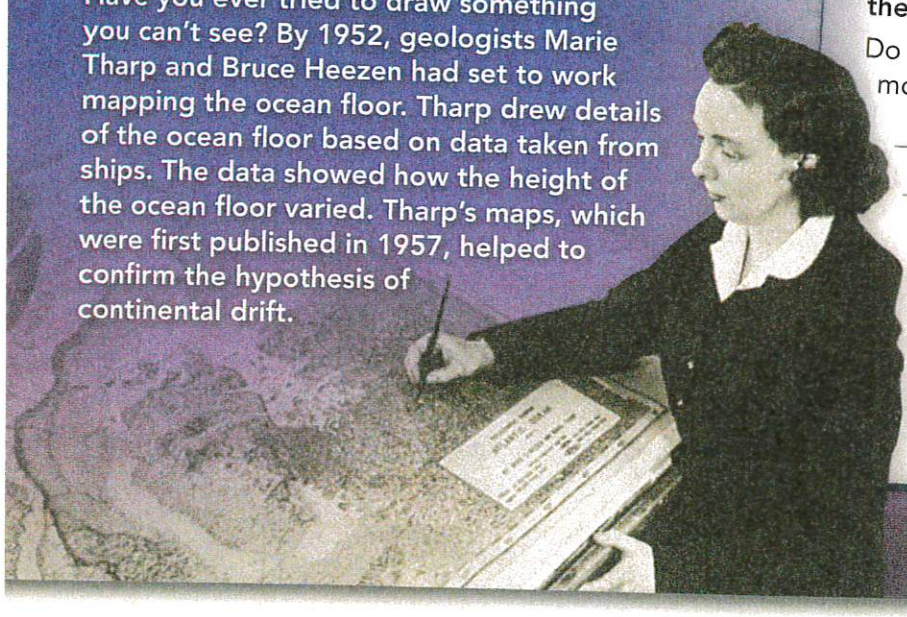
UNLOCK THE BIG ?

- What Are Mid-Ocean Ridges?
  GLE 9, 11 (ESS-M-A2)
- What Is Sea-Floor Spreading?
  GLE 11 (ESS-M-A2)
- What Happens at Deep-Ocean Trenches?
  GLE 11 (ESS-M-A2)

## MY PLANET DIARY

### Marie Tharp

Have you ever tried to draw something you can't see? By 1952, geologists Marie Tharp and Bruce Heezen had set to work mapping the ocean floor. Tharp drew details of the ocean floor based on data taken from ships. The data showed how the height of the ocean floor varied. Tharp's maps, which were first published in 1957, helped to confirm the hypothesis of continental drift.



## DISCOVERY

**Think about what structures might lie beneath Earth's oceans. Then answer the question.**

Do you think the ocean has valleys and mountains? Explain.

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

Lab zone® Do the Inquiry Warm-Up *What Is the Effect of a Change in Density?*

**Grade 8 Grade Level Expectations**

**GLE 9** Explain the historical development of the theories of plate tectonics, including continental drift and sea-floor spreading. (ESS-M-A2)

**GLE 11** Illustrate the movements of lithospheric plates as stated in the plate tectonics theory. (ESS-M-A2)

## What Are Mid-Ocean Ridges?

When scientists such as Marie Tharp drew maps showing features of the ocean floor, they made a surprising discovery. In certain places, the floor of the ocean appeared to be stitched together like the seams of a baseball! The seams curved along the ocean floors for great distances, as shown in **Figure 1.**

Scientists found that the seams formed mountain ranges that ran along the middle of some ocean floors. Scientists called these mountain ranges **mid-ocean ridges.** **Mid-ocean ridges form long chains of mountains that rise up from the ocean floor.**

## Vocabulary

- mid-ocean ridge
- sea-floor spreading
- deep-ocean trench
- subduction

## Skills

- Reading: Relate Text and Visuals
- Inquiry: Develop Hypotheses

In the mid-1900s, scientists mapped mid-ocean ridges using *sonar*. Sonar is a device that uses sound waves to measure the distance to an object. Scientists found that mid-ocean ridges extend into all of Earth's oceans. Most mid-ocean ridges lie under thousands of meters of water. Scientists also discovered that a steep-sided valley splits the tops of some mid-ocean ridges. The ridges form the longest mountain ranges on Earth. They are longer than the Rockies in North America and longer than the Andes in South America.

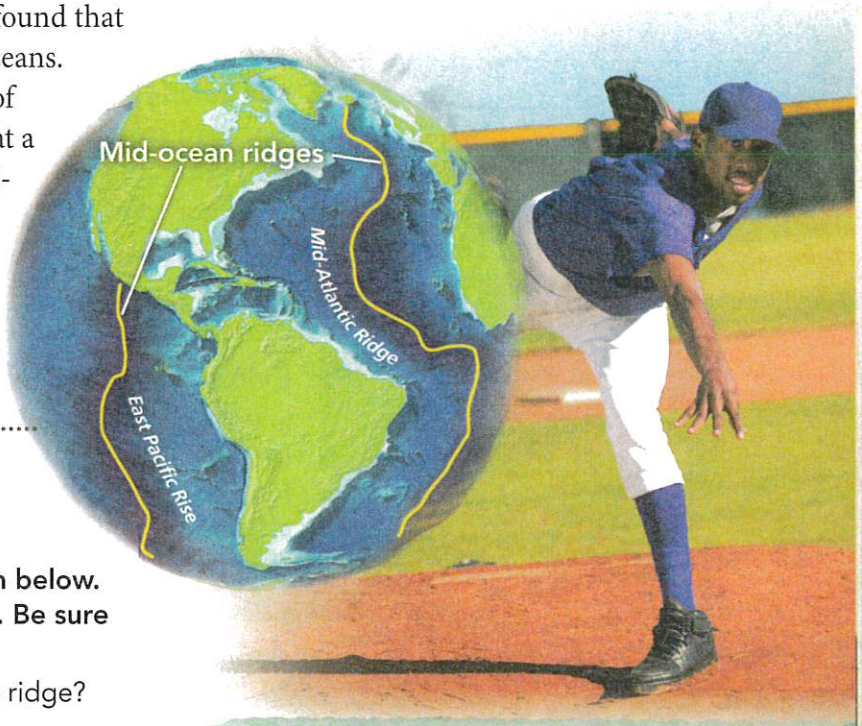



FIGURE 1

### Ocean Floors

Mid-ocean ridges rise from the sea floor like stitches on the seams of a baseball.

**Interpret Diagrams** **Look at the diagram below. Then use the scale to answer each question. Be sure to measure from the *front* of the diagram.**

1. How far below sea level is the peak of the ridge?

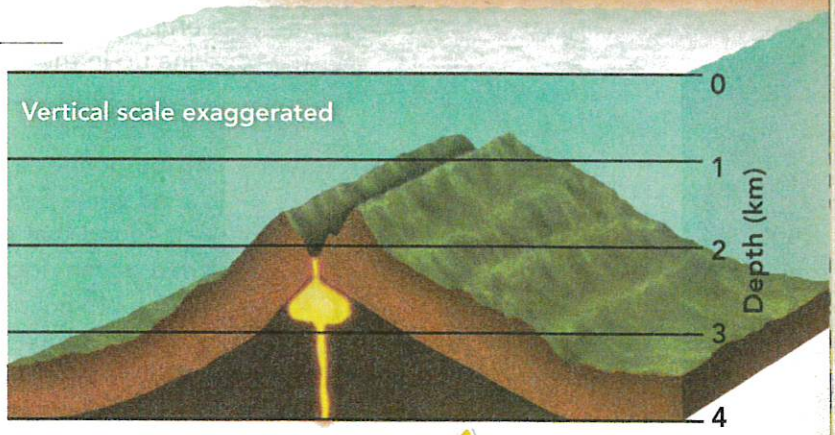
_____

2. How high does the ridge rise from the sea floor?

_____

3. CHALLENGE How deep below the peak is the valley marking the center of the ridge?

_____




Lab zone® Do the Quick Lab *Mid-Ocean Ridges.*

## Assess Your Understanding

got it?

- ○ I get it! Now I know that mid-ocean ridges form _____
- ○ I need extra help with _____

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

GLE 9, 11

**Grade 8 Grade Level Expectation**

**GLE 11** Illustrate the movements of lithospheric plates as stated in the plate tectonics theory. (ESS-M-A2)

# What Is Sea-Floor Spreading?

By the 1960s, geologists had learned more about mid-ocean ridges. They found that mid-ocean ridges continually add new material to the ocean floor. They called this process **sea-floor spreading.**

Sea-floor spreading begins at a mid-ocean ridge, which forms along a crack in the oceanic crust. Along the ridge, new molten material from inside Earth rises, erupts, cools, and hardens to form a solid strip of rock. **Sea-floor spreading adds more crust to the ocean floor. At the same time, older strips of rock move outward from either side of the ridge.**

**Figure 2** shows evidence that geologists have found for sea-floor spreading.


## Evidence From Ocean Material

In the central valley of mid-ocean ridges, scientists have found rocks shaped like pillows. Such rocks form only when molten material hardens quickly after erupting under water.


## Evidence From Magnetic Stripes

Rock on the ocean floor forms from molten material. As the material erupts, cools, and hardens, magnetic minerals inside the rock line up in the direction of Earth's magnetic poles. These minerals form unseen magnetic "stripes" on the ocean floor. But the magnetic poles occasionally reverse themselves. So each stripe defines a period when molten material erupted and hardened while Earth's magnetic poles did not change.

Scientists found that the pattern of magnetic stripes on one side of a mid-ocean ridge is usually a mirror image of the pattern on the other side of the ridge. The matching patterns show that the crust on the two sides of the ridge spread from the ridge at the same time and at the same rate.


## Evidence From Drilling Samples

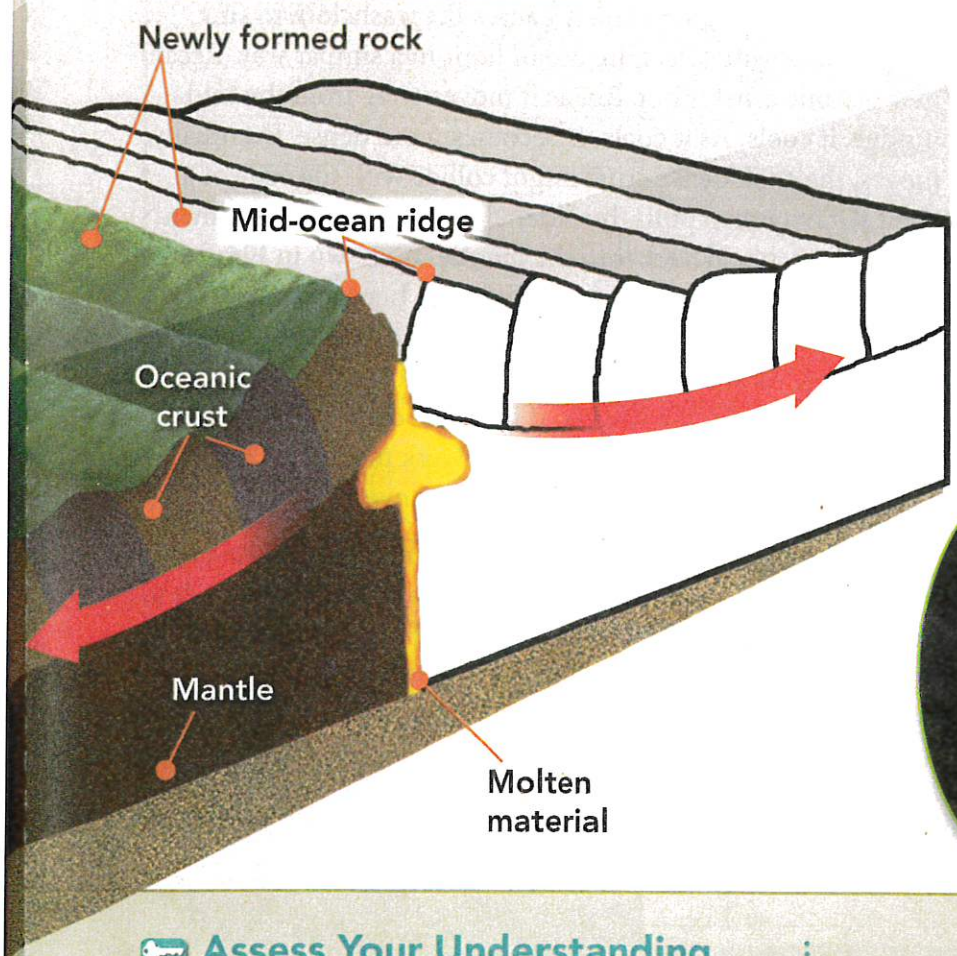
Scientists drilled into the ocean floor to obtain rock samples. They found that the farther away from a ridge a rock sample was taken, the older the rock was. The youngest rocks were always found at the center of the ridges. Recall that at the ridge center, molten material erupts and cools to form new crust. The rocks' age showed that sea-floor spreading had taken place.

FIGURE 2

## Sea-Floor Spreading

Some mid-ocean ridges have a valley that runs along their center. Evidence shows that molten material erupts through this valley. The material then hardens to form the rock of the ocean floor.

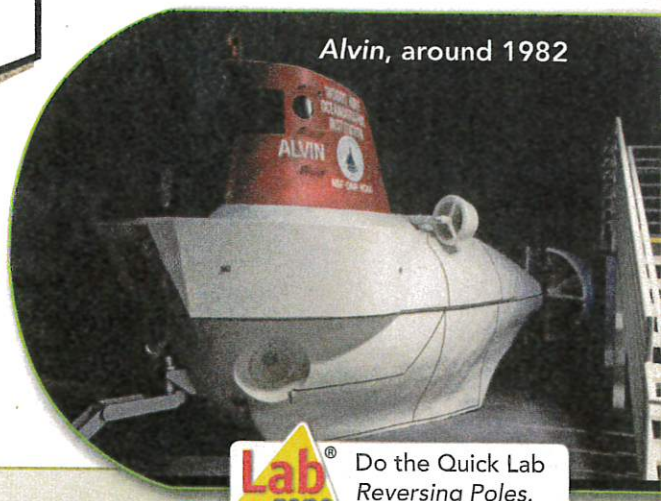
**Color the right half of the diagram to show magnetic striping. How does your drawing show evidence of sea-floor spreading?**




**Relate Text and Visuals**
How does the diagram show that new crust forms from molten material?

## did you know?

Scientists used the small submarine *Alvin* to explore the ocean floor. Did you know that *Alvin* was built to withstand the great pressure 4 kilometers down in the ocean?



*Alvin*, around 1982

Lab zone® Do the Quick Lab *Reversing Poles.*

## Assess Your Understanding

**1a. Review** In sea-floor spreading, new crust is added at a (mid-ocean ridge/magnetic stripe).

GLE 11

**b. Apply Concepts** Suppose Earth's magnetic polarity changed many times over a short period. What pattern of striping at a mid-ocean ridge would you expect to find?

GLE 11

## got it?

○ I get it! Now I know that sea-floor spreading is the process in which _____

○ I need extra help with _____

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

GLE 11

**Grade 8 Grade Level Expectation**

**GLE 11** Illustrate the movements of lithospheric plates as stated in the plate tectonics theory. (ESS-M-A2)

# What Happens at Deep-Ocean Trenches?

Does the ocean floor keep getting wider without stopping? No, eventually the ocean floor plunges into deep underwater canyons. These canyons are called **deep-ocean trenches.** At a deep-ocean trench, the oceanic crust bends downward. **In a process taking tens of millions of years, part of the ocean floor sinks back into the mantle at deep-ocean trenches.**

## The Process of Subduction

When a washcloth is placed in water, the water soaks into it. So, the density of the washcloth increases. The higher density causes the washcloth to sink.

Changes in density affect the ocean floor in a similar way. Recall that new oceanic crust is hot. But as it moves away from the mid-ocean ridge, it cools. As it cools, it becomes more dense. Eventually, as it moves, the cool, dense crust might collide with the edge of a continent. Gravity then pulls the older, denser oceanic crust down beneath the trench and back into the mantle, as shown in **Figure 3.**

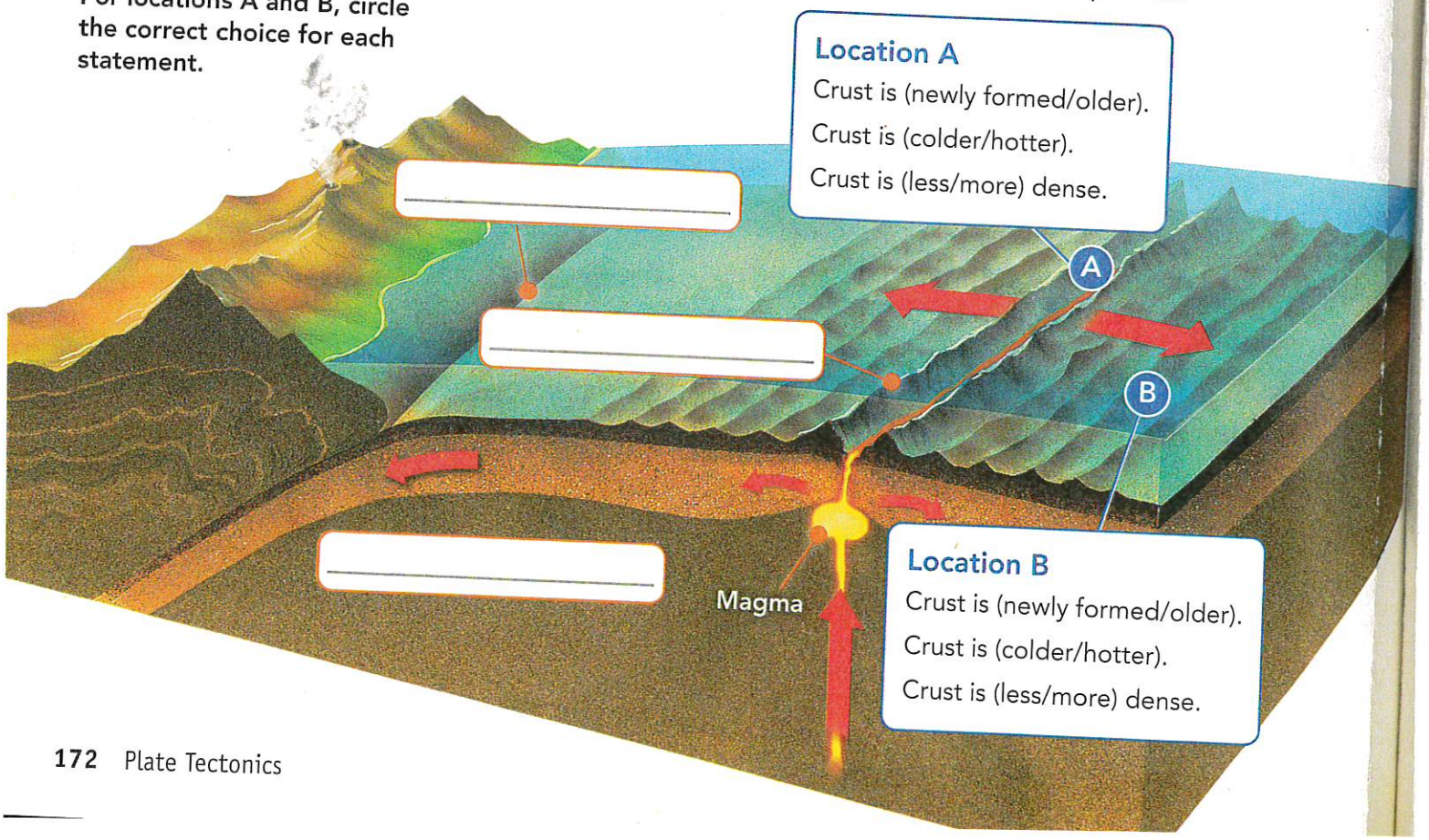
The process by which the ocean floor sinks beneath a deep-ocean trench and back into the mantle again is called **subduction** (sub DUC shun). As subduction occurs, crust closer to a mid-ocean ridge moves away from the ridge and toward a deep-ocean trench. Sea-floor spreading and subduction often work together. They move the ocean floor as if it were on a giant conveyor belt.

FIGURE 3

**Subduction**

Oceanic crust created along a mid-ocean ridge is destroyed at a deep-ocean trench. During the process of subduction, oceanic crust sinks down beneath the trench into the mantle.

**Summarize** **Label the mantle, the mid-ocean ridge, and the deep-ocean trench. For locations A and B, circle the correct choice for each statement.**

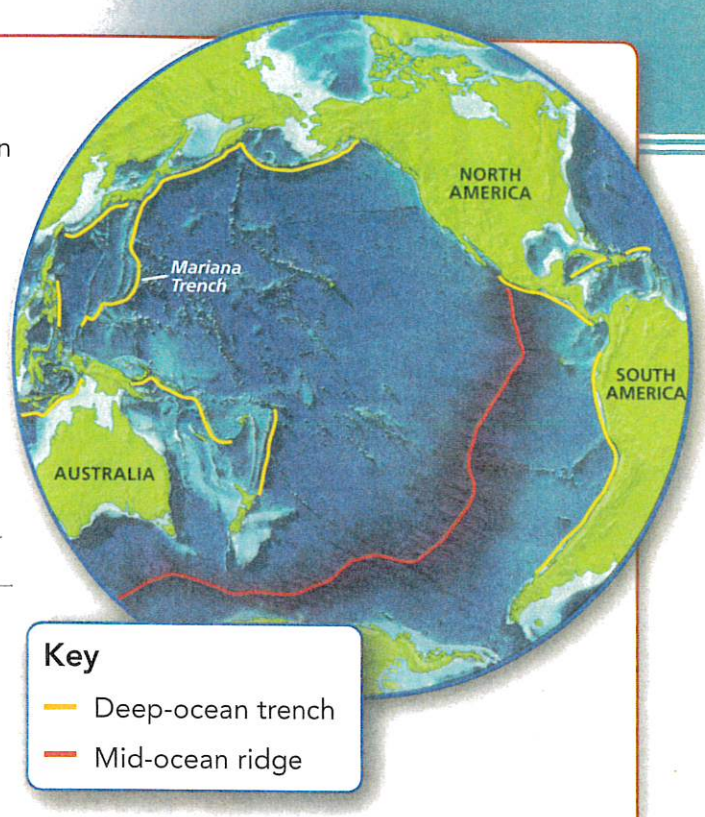


# apply it!

The deepest part of the ocean is along the Mariana Trench. This trench is one of several trenches (shown in yellow) in the Pacific Ocean. After reading the main text in this lesson, answer the questions below.

**1 Infer** At the Pacific Ocean's deep-ocean trenches, oceanic crust is (spread/subducted).

**2 Develop Hypotheses** The Pacific Ocean is shrinking. Explain this fact in terms of subduction at deep-ocean trenches and spreading at mid-ocean ridges.




## Subduction and Earth's Oceans

The processes of subduction and sea-floor spreading can change the size and shape of the oceans. Because of these processes, the ocean floor is renewed about every 200 million years. That is the time it takes for new rock to form at the mid-ocean ridge, move across the ocean, and sink into a trench.

The sizes of Earth's oceans are determined by how fast new crust is being created at mid-ocean ridges and how fast old crust is being swallowed up at deep-ocean trenches. An ocean surrounded by many trenches may shrink. An ocean with few trenches will probably grow larger.

For example, the Atlantic Ocean is expanding. This ocean has only a few short trenches. As a result, the spreading ocean floor has almost nowhere to go. Along the continental margins, the oceanic crust of the Atlantic Ocean floor is attached to the continental crust of the continents around the ocean. So as the Atlantic's ocean floor spreads, the continents along its edges also move. Over time, the whole ocean gets wider.

Lab zone® Do the Lab Investigation *Modeling Sea-Floor Spreading.*

## Assess Your Understanding

**2a. Review** Subduction takes place at (mid-ocean ridges/deep-ocean trenches). GLE 11

**b. Relate Cause and Effect** Why does subduction occur?

GLE 11

## got it?

○ I get it! Now I know that at deep-ocean trenches

○ I need extra help with

*Go to* my science coach *online for help with this subject.* GLE 11

Louisiana

LESSON 1

# Fossils

UNLOCK THE BIG ?

- What Are Fossils?
  GLE 31 (ESS-M-B1)
- What Are the Kinds of Fossils?
  GLE 31 (ESS-M-B1)
- What Do Fossils Show?
  GLE 31 (ESS-M-B1)

## MY PLANET DIARY

DISCOVERY

### A Dinosaur Named Sue

On a hot day in August 1990, Sue Hendrickson was hunting for fossils near the town of Faith, South Dakota. She found some little pieces of bone below a cliff. When she looked up at the cliff, she saw more bones. These bones weren't little. They were enormous! She and other scientists determined that they were the bones of a *Tyrannosaurus rex*. In fact, she'd found the largest and most complete skeleton of a *Tyrannosaurus* ever discovered. Today, the skeleton, nicknamed "Sue," is on display at the Field Museum in Chicago.

**Communicate** Write your answer to each question below. Then discuss your answers with a partner.

1. What science skills did Sue Hendrickson use when she discovered Sue?

_____

_____

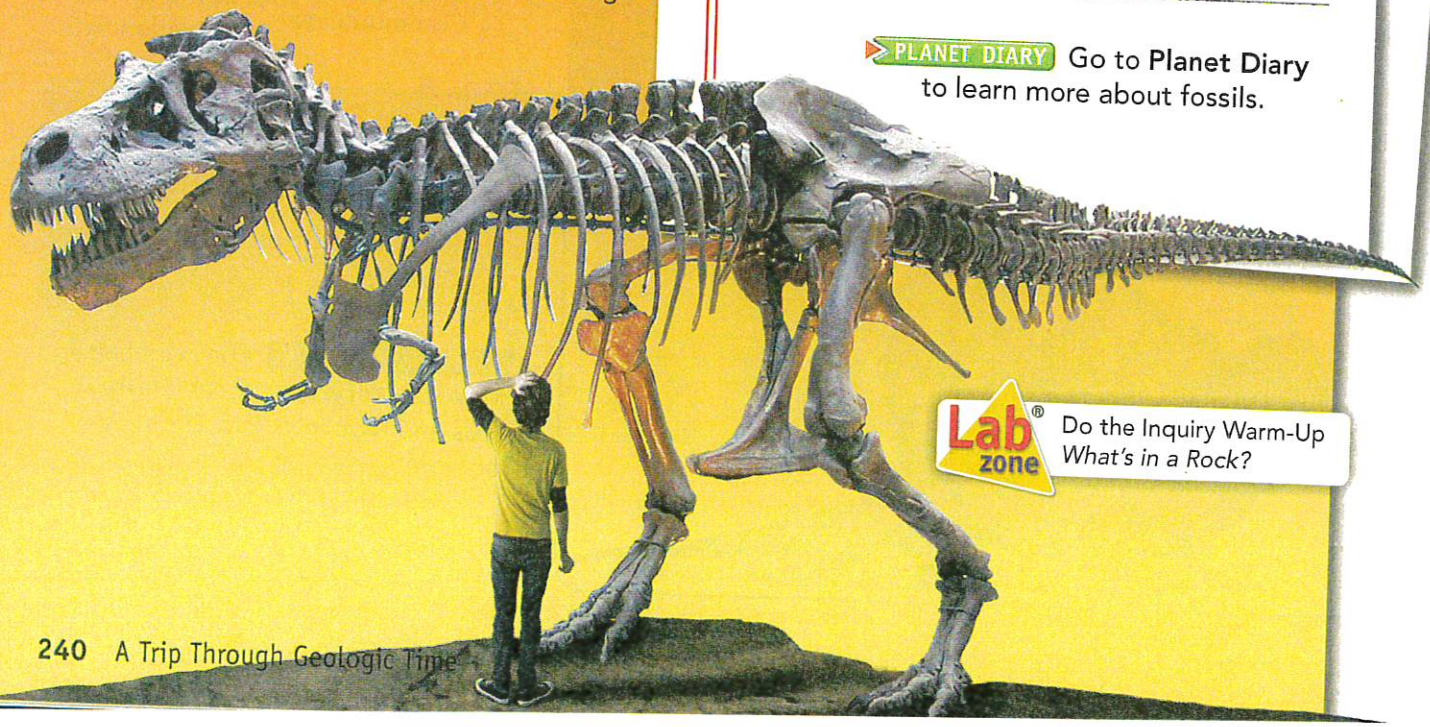
2. What do you think scientists can learn by studying dinosaur skeletons?

_____

_____

_____

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



Lab zone® Do the Inquiry Warm-Up *What's in a Rock?*

## Vocabulary

- fossil
- mold
- cast
- petrified fossil
- carbon film
- trace fossil
- paleontologist
- evolution
- extinct

## Skills

- Reading: Compare and Contrast
- Inquiry: Pose Questions

# What Are Fossils?

**Grade 8 Grade Level Expectation**

**GLE 31** Compare fossils from different geologic eras and areas of Earth to show that life changes over time. (ESS-M-B1)

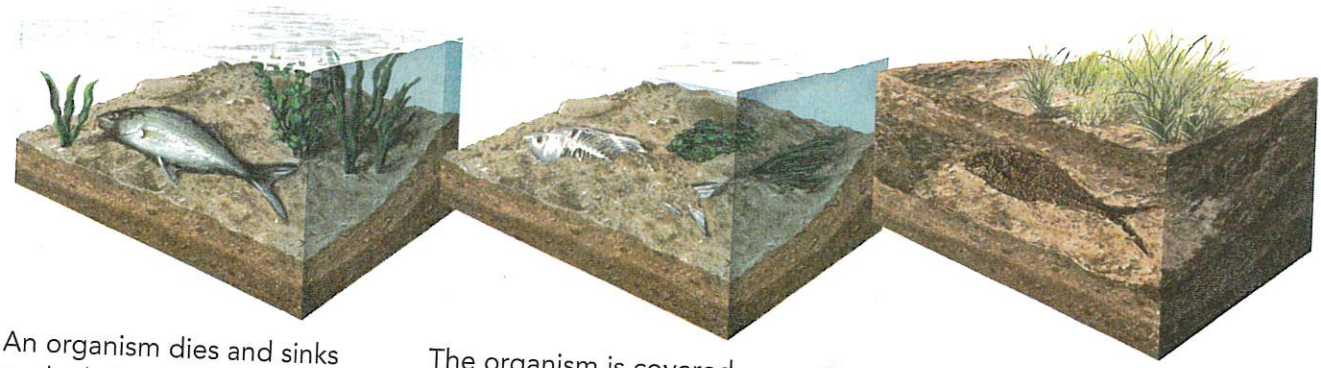
Sue is one of the most nearly complete dinosaur fossils ever found. **Fossils** are the preserved remains or traces of living things. **Most fossils form when living things die and are buried by sediment. The sediment slowly hardens into rock and preserves the shapes of the organisms.** Sediment is made up of rock particles or the remains of living things. Most fossils form from animals or plants that once lived in or near quiet water such as swamps, lakes, or shallow seas where sediment builds up. In **Figure 1,** you can see how a fossil might form.

When an organism dies, its soft parts often decay quickly or are eaten by animals. That is why only hard parts of an organism generally leave fossils. These hard parts include bones, shells, teeth, seeds, and woody stems. It is rare for the soft parts of an organism to become a fossil.

FIGURE 1

**INTERACTIVE ART How a Fossil Forms**

A fossil may form when sediment quickly covers an organism's body.



An organism dies and sinks to the bottom of a lake.

The organism is covered by sediment.

**Sequence** What happens next?

_____

_____

Lab zone® Do the Quick Lab *Sweet Fossils.*

## Assess Your Understanding

got it?

○ I get it! Now I know that fossils are _____

_____

○ I need extra help with _____

_____

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

GLE 31

**Grade 8 Grade Level Expectation**

**GLE 31** Compare fossils from different geologic eras and areas of Earth to show that life changes over time. (ESS-M-B1)

# What Do Fossils Show?

Would you like to hunt for fossils all over the world? And what could you learn from them? Scientists who study fossils are called **paleontologists** (pay lee un TAHL uh jists). Together, all the information that paleontologists have gathered about past life is called the fossil record. **The fossil record provides evidence about the history of life and past environments on Earth. The fossil record also shows how different groups of organisms have changed over time.**

## Fossils and Past Environments

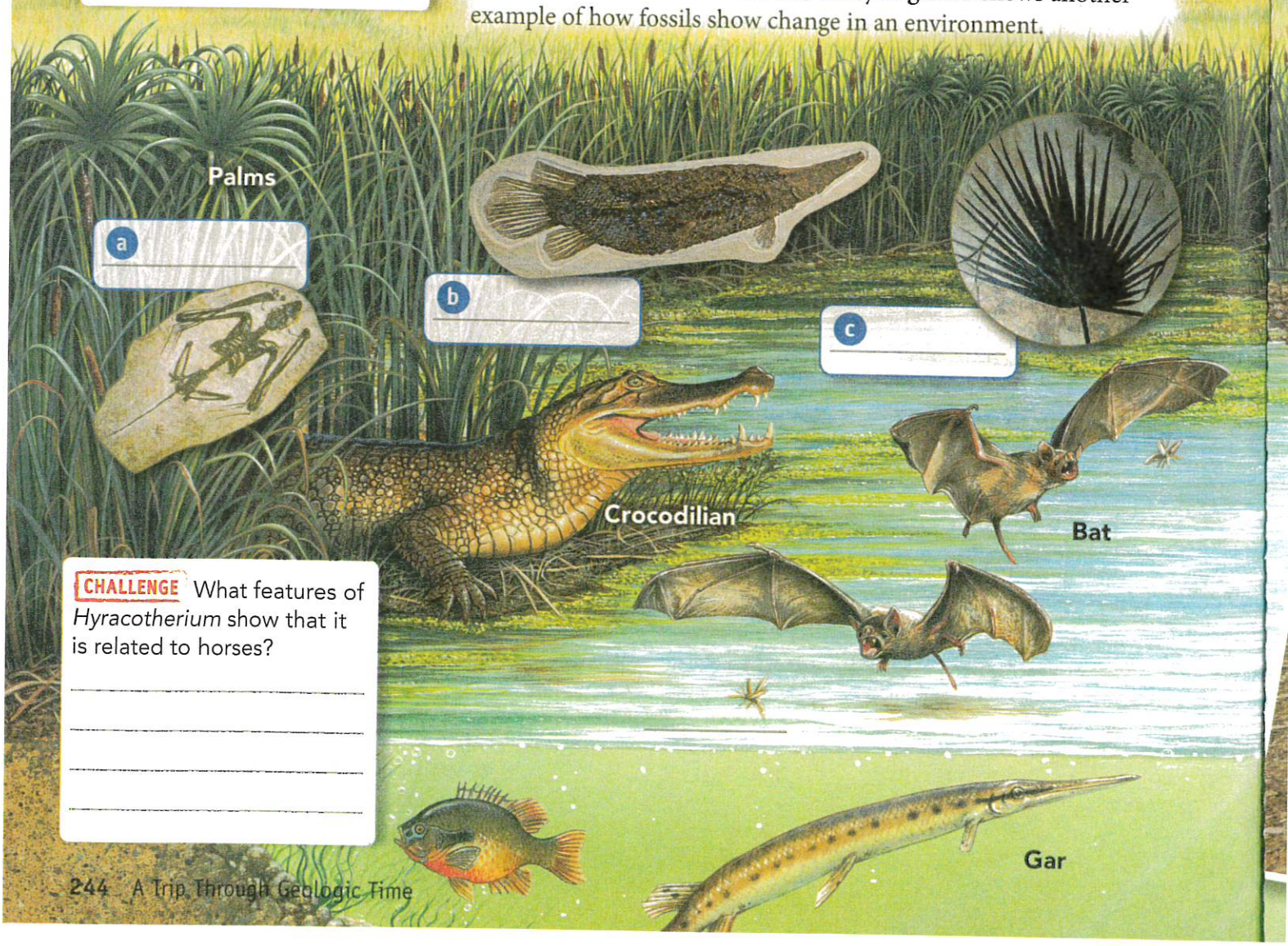
Paleontologists use fossils to build up a picture of Earth's past environments. The fossils found in an area tell whether the area was a shallow bay, an ocean bottom, or a freshwater swamp.

Fossils also provide evidence about the past climate of a region. For example, coal has been found in Antarctica. But coal forms only from the remains of plants that grow in warm, swampy regions. The presence of coal shows that the climate of Antarctica was once much warmer than it is today. **Figure 3** shows another example of how fossils show change in an environment.

FIGURE 3

**INTERACTIVE ART Wyoming, 50 Million Years Ago**

Today, as you can see in the postcard, Wyoming has areas of dry plateaus. But 50 million years ago, the area was very different. **Infer** **Identify the organism or kind of organism shown by fossils a, b, and c.**




**CHALLENGE** What features of *Hyracotherium* show that it is related to horses?

## Change and the Fossil Record

The fossil record also reveals changes in organisms. Older rocks contain fossils of simpler organisms. Younger rocks contain fossils of both simple and more complex organisms. In other words, the fossil record shows that life on Earth has evolved, or changed over time. **Evolution** is the change in living things over time.

The fossil record shows that millions of types of organisms have evolved. But many others, including the dinosaurs, have become extinct. A type of organism is **extinct** if it no longer exists and will never again live on Earth.

Scientists use fossils to reconstruct extinct organisms and determine how they may be related to living organisms. For example, the animals called *Hyracotherium* in **Figure 3** are related to modern horses.


Lab zone® Do the Quick Lab *Modeling the Fossil Record.*

### Assess Your Understanding

**2a. Explain** What does the fossil record show about how life has changed over time?

GLE 31

**b. Apply Concepts** Give an example of a question you could ask about a fossil of an extinct organism.

GLE 31

**got it?**

○ I get it! Now I know that the fossil record shows _____

○ I need extra help with _____

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

GLE 31

Louisiana

LESSON 2

# The Relative Age of Rocks

UNLOCK THE BIG ?

- How Old Are Rock Layers?
  GLE 33 (ESS-M-B2); 34, 35 (ESS-M-B3)
- How Can Rock Layers Change?
  GLE 34 (ESS-M-B3)

## MY PLANET DIARY — BLOG

Posted by **Owen**

Location **Tacoma, WA**

A couple of summers ago, my dad took me rock climbing for the first time. I went to a place called Frenchman Coulee in central Washington. It was really cool because the rock was basalt, which forms in giant pillars. It starts as lava, and then cools and you can see the different lava flows in the rock. Another cool thing is that Frenchman Coulee, which is a canyon, was gouged out by huge Ice Age floods.

**Communicate** **Discuss the question below with a partner. Then answer it on your own.**

How do you think scientists figure out the age of the basalt layers at Frenchman Coulee?

PLANET DIARY Go to **Planet Diary** to learn more about the age of rock layers.

Lab zone® Do the Inquiry Warm-Up *Which Layer Is the Oldest?*

**Grade 8 Grade Level Expectations**

**GLE 33** Use historical data to draw conclusions about the age of Earth (e.g., half-life, rock strata). (ESS-M-B2)

**GLE 34** Apply geological principles to determine the relative ages of rock layers (e.g., original horizontality, superposition, cross-cutting relationships). (ESS-M-B3)

**GLE 35** Describe how processes seen today are similar to those in the past (e.g., weathering, erosion, lithospheric plate movement). (ESS-M-B3)

## How Old Are Rock Layers?

If you found a fossil in a rock, you might start by asking, "What is it?" Your next question would probably be, "How old is it?" The first step is to find the age of the rock.

**Relative and Absolute Age** Geologists have two ways to express the age of a rock. The **relative age** of a rock is its age compared to the ages of other rocks. You have probably used the idea of relative age when comparing your age with someone else's. For example, if you say that you are older than your brother but younger than your sister, you are describing your relative age.

## Vocabulary

- relative age
- absolute age
- law of superposition
- extrusion
- intrusion
- fault
- index fossil
- unconformity

## Skills

- Reading: Relate Text and Visuals
- Inquiry: Infer

The relative age of a rock does not provide its absolute age. The **absolute age** of a rock is the number of years that have passed since the rock formed. It may be impossible to know a rock's absolute age exactly, so geologists often use both absolute and relative ages.

### Rock Layers

Fossils are most often found in layers of sedimentary rock. Geologists use the **law of superposition** to determine the relative ages of sedimentary rock layers. **According to the law of superposition, in undisturbed horizontal sedimentary rock layers the oldest layer is at the bottom. Each higher layer is younger than the layers below it.** The deeper you go, the older the rocks are.

**Figure 1** shows rock layers in the Grand Canyon. Rock layers like these form a record of Earth's history. Scientists can study this record to understand how Earth and life on Earth have changed.

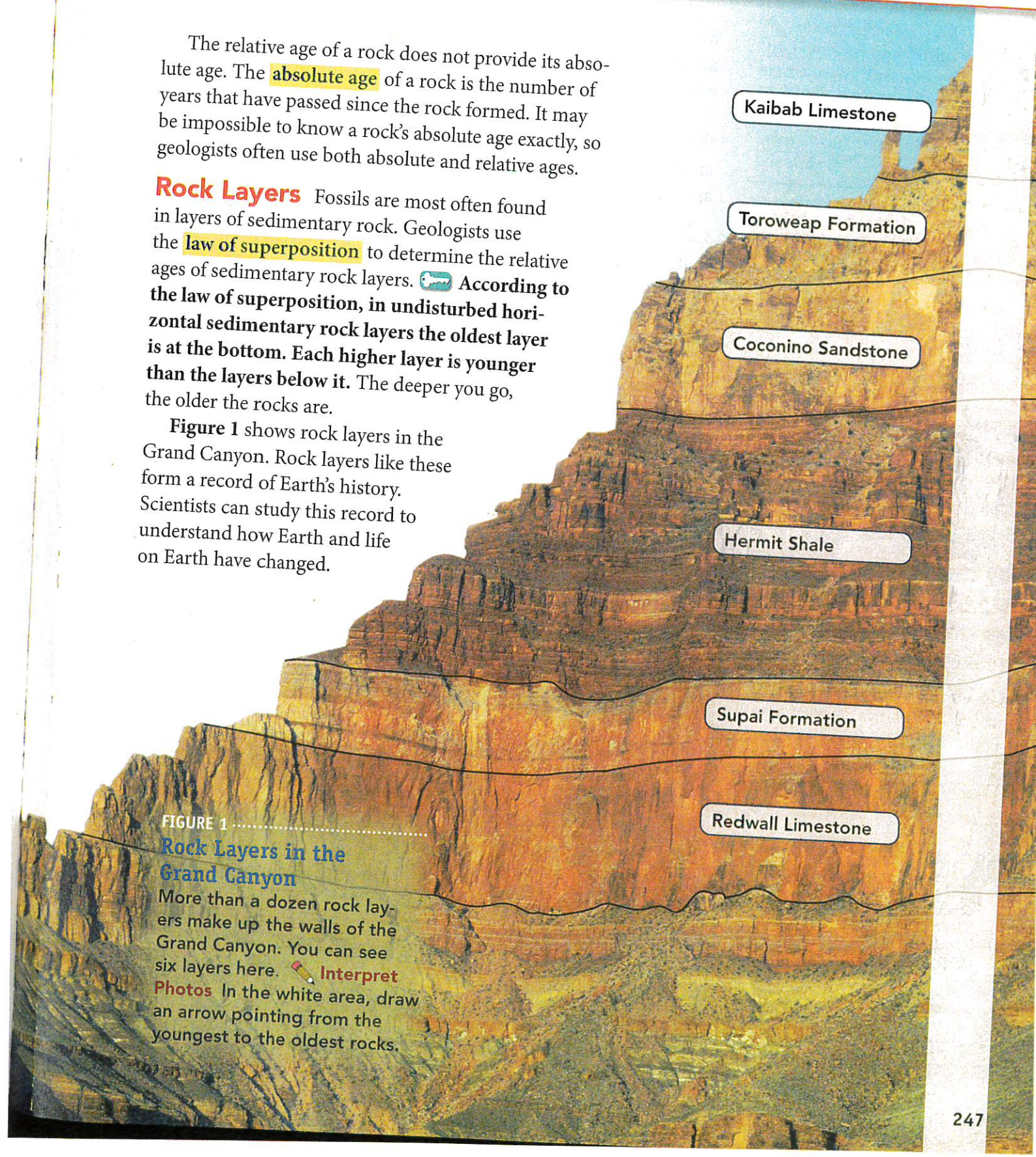



**FIGURE 1**
**Rock Layers in the Grand Canyon**
More than a dozen rock layers make up the walls of the Grand Canyon. You can see six layers here. **Interpret Photos** In the white area, draw an arrow pointing from the youngest to the oldest rocks.

**Vocabulary** Prefixes How does knowing the prefixes *in-* and *ex-* help you remember the difference between an intrusion and an extrusion?

## Clues From Igneous Rock

There are other clues to the relative ages of rocks besides the position of rock layers. To determine relative age, geologists also study extrusions and intrusions of igneous rock, faults, and index fossils.

Molten material beneath Earth's surface is called magma. Magma that reaches the surface is called lava. Lava that hardens on the surface and forms igneous rock is called an **extrusion.** An extrusion is always younger than the rocks below it.

Magma may push into bodies of rock below the surface. There, the magma cools and hardens into a mass of igneous rock called an **intrusion.** An intrusion is always younger than the rock layers around and beneath it. **Figure 2** shows an intrusion.

## Clues From Faults

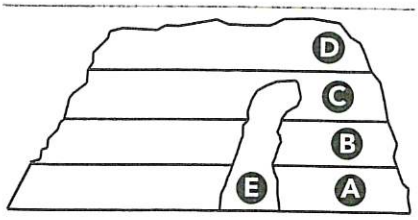
More clues come from the study of faults. A **fault** is a break in Earth's crust. Forces inside Earth cause movement of the rock on opposite sides of a fault.

A fault is always younger than the rock it cuts through. To determine the relative age of a fault, geologists find the relative age of the youngest layer cut by the fault. **Figure 3** shows a fault.

## apply it!

The diagram below shows rock layers found at a site.

1. Circle the area on the diagram that shows an intrusion.
2. Shade the oldest layer on the diagram.
3. Infer What can you infer about the relative ages of areas B and E?



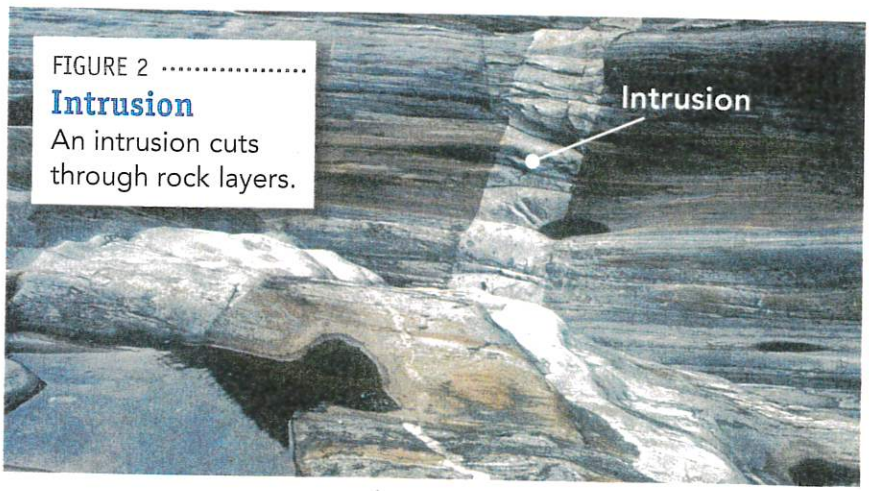




FIGURE 2
**Intrusion**
An intrusion cuts through rock layers.

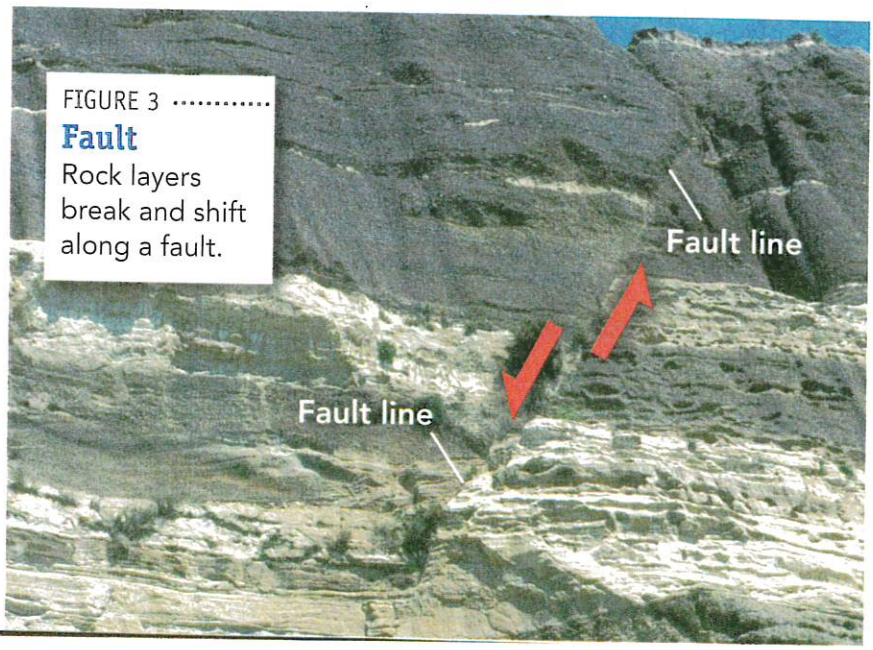



FIGURE 3
**Fault**
Rock layers break and shift along a fault.

## How Do Fossils Show Age?

To date rock layers, geologists first find the relative age of a layer of rock at one location. Then they can match layers in other locations to that layer.

Certain fossils, called index fossils, help geologists match rock layers. To be useful as an **index fossil**, a fossil must be widely distributed and represent an organism that existed for a geologically short period of time. **Index fossils are useful because they tell the relative ages of the rock layers in which they occur.** Scientists infer that layers with matching index fossils are the same age.

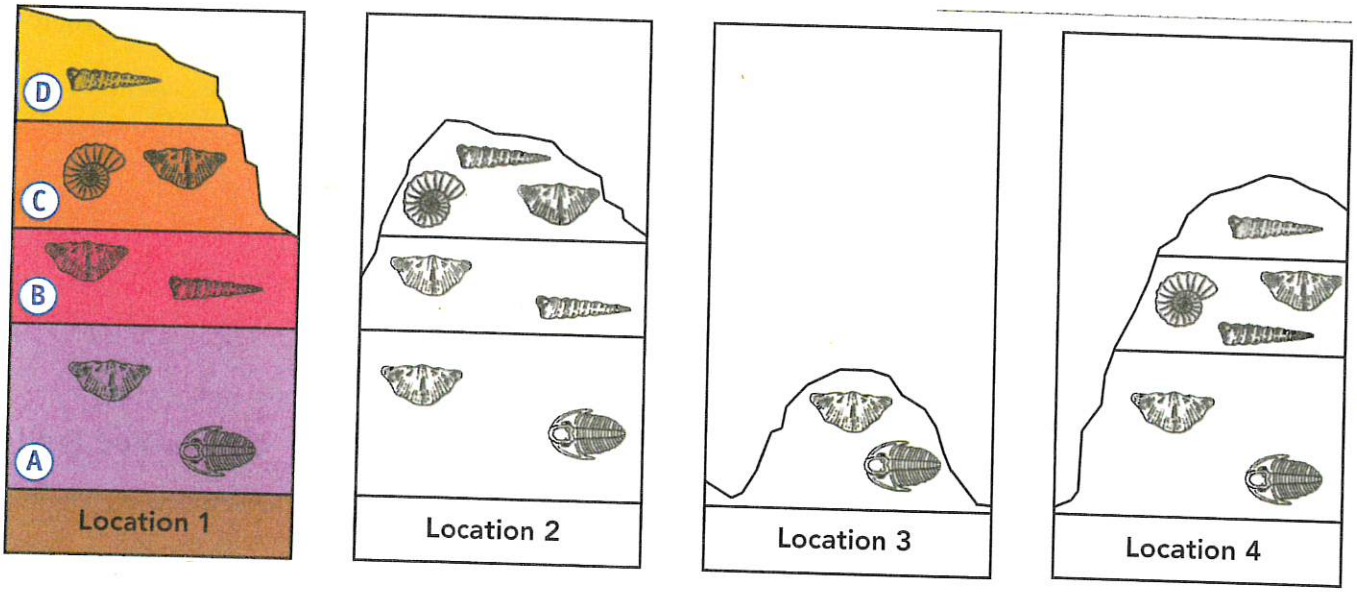
You can use index fossils to match rock layers. Look at **Figure 4**, which shows rock layers from four different locations. Notice that two of the fossils are found in only one of these rock layers. These are the index fossils.

FIGURE 4

INTERACTIVE ART **Index Fossils**

Scientists use index fossils to match rock layers.

**Interpret Diagrams** **Label the layers to match the first area shown. Circle the fossil or fossils that you can use as index fossils. What can you infer about the history of Location 4?**




Lab zone® Do the Lab Investigation *Exploring Geologic Time Through Core Samples.*

## Assess Your Understanding

**1a. Explain** In an area with several different rock layers, which is oldest? Explain.

GLE 34

**b. Infer** How could a geologist match the rock layers in one area to rock layers found in another area?

GLE 33

### got it?

○ I get it! Now I know that you can find the relative age of rocks by

○ I need extra help with

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

GLE 33, 34, 35

**Grade 8 Grade Level Expectation**

**GLE 34** Apply geological principles to determine the relative ages of rock layers (e.g., original horizontality, superposition, cross-cutting relationships). (ESS-M-B3)

# How Can Rock Layers Change?

The geologic record of sedimentary rock layers is not complete. In fact, most of Earth's geologic record has been lost to erosion. **Gaps in the geologic record and folding can change the position in which rock layers appear.** Motion along faults can also change how rock layers line up. These changes make it harder for scientists to reconstruct Earth's history. **Figure 5** shows how the order of rock layers may change.

**Relate Text and Visuals** Underline the sentences that explain how the rock layers in Figure 5 changed.

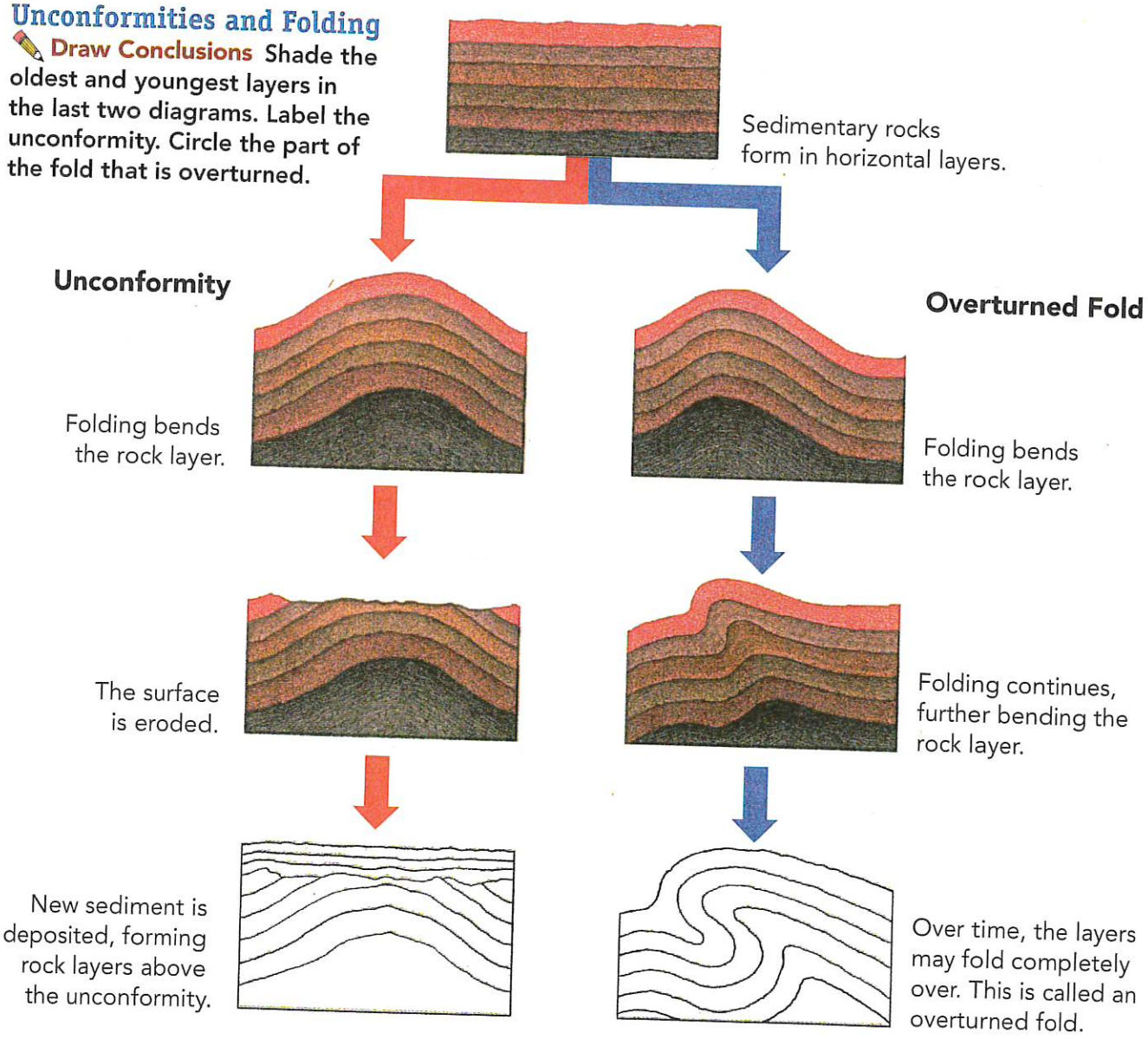
## Gaps in the Geologic Record

When rock layers erode away, an older rock surface may be exposed. Then deposition begins again, building new rock layers. The surface where new rock layers meet a much older rock surface beneath them is called an unconformity. An **unconformity** is a gap in the geologic record. It shows where rock layers have been lost due to erosion.

FIGURE 5

**Unconformities and Folding**

**Draw Conclusions** Shade the oldest and youngest layers in the last two diagrams. Label the unconformity. Circle the part of the fold that is overturned.



**Folding** Sometimes, forces inside Earth fold rock layers so much that the layers are turned over completely. In this case, the youngest rock layers may be on the bottom!

No one place holds a complete geologic record. Geologists compare rock layers in many places to piece together as complete a sequence as possible.

## apply it!

Study the photo. Then answer the questions.

1. What does the photo show? (an unconformity/ folding)

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

3. CHALLENGE What can you infer about the history of this area?

Lab zone® Do the Quick Lab *How Did It Form?*

## Assess Your Understanding

**2a. List** Name two ways rock layers can change.

GLE 34

**b. Explain** How does folding change rock layers?

GLE 34

**c. Draw Conclusions** Two locations include a layer of rock with a particular index fossil. In one location, the layer occurs in a higher position than in the other. What can you conclude about the history of the two areas?

GLE 34

## got it?

○ I get it! Now I know that rock layers can change due to _____

○ I need extra help with _____

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

GLE 34

# ASSIGNMENTS

Name _____ Date _____

# What Are Elements?

**Match each definition to its term.**

**Definitions**

____ **1.** a substance that cannot be broken apart into other substances

____ **2.** the smallest particle of an element that still has the properties of that element

____ **3.** the negatively charged particles that make up part of every atom

____ **4.** the central core of an atom

____ **5.** a particle in the nucleus with a positive charge

____ **6.** a particle in the nucleus with no charge

____ **7.** two or more atoms joined by chemical bonds

**Terms**

**a.** electrons

**b.** nucleus

**c.** proton

**d.** molecule

**e.** neutron

**f.** element

**g.** atom

**Fill in the blanks.**

**8.** In 1869, Russian chemist Dmitri Mendeleev developed a way to classify

_____.

**9.** The modern periodic table is a table in which the elements are arranged by their

_____.

**10.** Elements are arranged in order of increasing _____ number, which is the number of protons in the nucleus.

**11.** The colors of the boxes show whether elements are _____,

_____, or _____.

**12.** _____ have properties of both metals and nonmetals.

Name _____ Date _____

**13. Main Idea** What are the tiny particles that make up an atom?

_____

**14. Vocabulary** What information about each element is contained in its box in the periodic table?

_____

_____

**15. Reading Skill: Compare and Contrast** Explain how diamond and graphite are similar and how they are different.

_____

_____

**16. Critical Thinking: Analyze** Suppose you are given a sample of an element. You are asked to identify the element as a metal or a nonmetal. What are some properties you would look for? Explain.

_____

_____

**17. Inquiry Skill: Predict** A uranium atom has 92 protons in its nucleus. Use what you know about atoms to predict how many electrons a uranium atom has.

_____

_____

**18. Test Prep** The properties of metalloids are

**A** more like metals.

**B** more like nonmetals.

**C** somewhat like metals and somewhat like nonmetals.

**D** somewhat like gases and somewhat like metals.

Name _____ Date _____

# What Are Compounds?

**Write answers to the questions on the lines below.**

1. What is a compound?

_____

_____

2. What happens during a chemical reaction?

_____

_____

3. What is the chemical formula that has two hydrogen atoms and one oxygen atom?

_____

4. What elements does the compound iron oxide ($Fe_2O_3$) have?

_____

_____

5. What is needed to create chemical reactions?

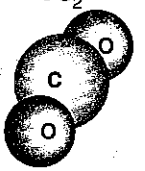
_____

_____

6. What unique properties does the compound water have?

_____

Carbon Dioxide $CO_2$



Name _____ Date _____

7. **Main Idea** Why can elements be called the building blocks of matter?

_____

_____

8. **Vocabulary** In your own words, define *chemical formula.*

_____

_____

9. **Reading Skill: Compare and Contrast** How are elements and compounds alike? How are they different?

_____

_____

_____

10. **Critical Thinking: Apply** Research some compounds other than the ones mentioned in this lesson. Pick one example and explain how you know it is a compound.

_____

_____

11. **Inquiry Skill: Infer** Ty added water to a mixture of two other substances. A short time later, he observed that one substance had turned green and another had turned orange. What might Ty infer?

_____

_____

12. **Test Prep** Elements and compounds

**A** are pure substances.

**B** are made up of atoms.

**C** have specific properties.

**D** are all of the above.

Day 7 Assignment

Name: _____

**KEY IDEAS**

- The theory of continental drift says that all continents were once connected in a super continent called pangea.
- Alfred Wegener's theory was based on 3 pieces of evidence
  - The continents look like they fit together similar to puzzle pieces.
  - Fossils of the same dinosaurs (who could not swim) were found in SA and Africa.
  - Climate evidence: tropical plants found in Arctic
- The fossil record shows that continents have changed locations.
- Fossils of tropical plants have been found in Antarctica, which supports the claim that land mass was once located in an equatorial area.
- Fossils of aquatic organisms have been found in deserts, which supports that that area was once covered by water.
- At mid ocean ridges, magma is pushed to the surface.
- At subduction zones, older oceanic crust sinks back into the mantle.
- The rock closer to mid ocean ridges is younger than rock that is farther away.
- Seafloor spreading continually creates new crust and pushes it back into the mantle at trenches. (CYCLE)
- Earth's crust is broken up into plates that move very slowly

**Define the Following Terms:**

**Continental Drift:** _____

_____

**Mid-Ocean Ridge:** _____

_____

**Pangea:** _____

_____

**Sea-floor spreading:** _____

_____

**Subduction:** _____

_____

**Questions to Answer:**

**1.** Identify and explain three pieces of evidence that support the theory of continental drift.

**2.** Michelle is a scientist working in Antarctica. She finds fossils of *Glossopteris* on Antarctica. Her colleague Joe has found *Glossopteris* fossils in India. Write an explanation for how this could have happened. Use evidence to support your answer.

3. Which of the following is evidence of seafloor spreading?

**A.** Matching patterns of magnetic stripes found in the crust of the ocean floor.
**B.** New rock found farther from mid-ocean ridges than older rock
**C.** Pieces of different crust found on different continents
**D.** Changes in the climate of the continent of Africa

4. Which best explains why fossils of the same species of reptile were discovered in South America and in Western Africa?

**A.** The reptiles evolved in both South America and Africa
**B.** The continents of South America and Africa were once joined
**C.** Land bridges connected the continents of South America and Africa.
**D.** The reptiles could swim the distance between South America and Africa

5. Explain why, in the past 100 years, the continents seem to be relatively unchanged.

_____

_____

_____

_____

The map below shows the Western Hemisphere.

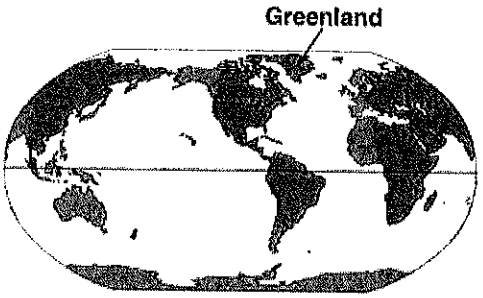
6. Coral fossils that are about 90 million years old have been found at site X. What do these fossils indicate?

**A.** Coral was once a land organism
**B.** Coral migrated north of the equator
**C.** Site X was once covered by a warm sea
**D.** Site X was once located further north

7. Fossils of shellfish have been discovered on the top of the Himalayan Mountains and Rocky Mountains. What is the *best* conclusion that scientists can make from these discoveries?

**A.** Erosion moved fossils
**B.** Mountain animals eat seafood
**C.** Water once covered those areas
**D.** Shellfish evolved to live in water and on land

The map below shows the location of Greenland. Today Greenland has a very cold climate, however, fossils of plants have been discovered there.




8. Which best explains why fossils of plants were found in Greenland?

**A.** Greenland has a short winter.
**B.** Greenland once had a warm climate.
**C.** Plants are able to survive in very cold weather.
**D.** Plants were brought there from cold climates.

9. In sea-floor spreading, molten material rises from the mantle and erupts

**A.** At the north and south poles
**B.** Along mid-ocean ridges
**C.** Along the edges of all continents
**D.** In deep-ocean trenches

10. Which is true about the rocks farther away from mid-ocean ridges than those nearer to it?

**A.** The rocks that are farther away are older than the rocks that are closer
**B.** The rocks that are farther away are younger than the rocks that are closer
**C.** The rocks that are farther away contain more organisms than the rocks that are closer
**D.** The rocks that are farther away contain fewer organisms than the rocks that are closer

Day 8 Assignment

Name: _____

**KEY IDEAS**

- Fossils are the mineralized remains of ancient organisms (plants and animals)
  - Fossils are found in sedimentary rock.
  - Sedimentary rock forms in layers.
- The law of superposition says older layers are on the bottom, younger layers on the top.
- Fossil Record: Scientists use fossils and the layers we find them in to tell the history of Earth.
- Relative dating is putting things in order based on their strata position. The story begins at the bottom.
- Faults and intrusions are always younger than the layers they cut through.
- A fault is a crack or break in numerous rock layers.
- An intrusion is when magma is forced up through rock layers.

**Define the Following Terms:**

**Absolute Age:** _____

_____

**Extrusion:** _____

_____

**Fault:** _____

_____

**Fossil:** _____

_____

**Index fossil:** _____

_____

**Intrusion:** _____

_____

**Law of Superposition:** _____

_____

**Relative Age:** _____

_____

**Questions to Answer:**

**1.** Two locations include a layer of rock with a particular index fossil. In one location, the layer occurs in a higher position than in the other. What can you conclude about the history of the two areas? Explain your answer.

_____

_____

_____

_____

_____

**2.** Which organism has a better chance of leaving a fossil: a jellyfish or a bony fish? Explain.

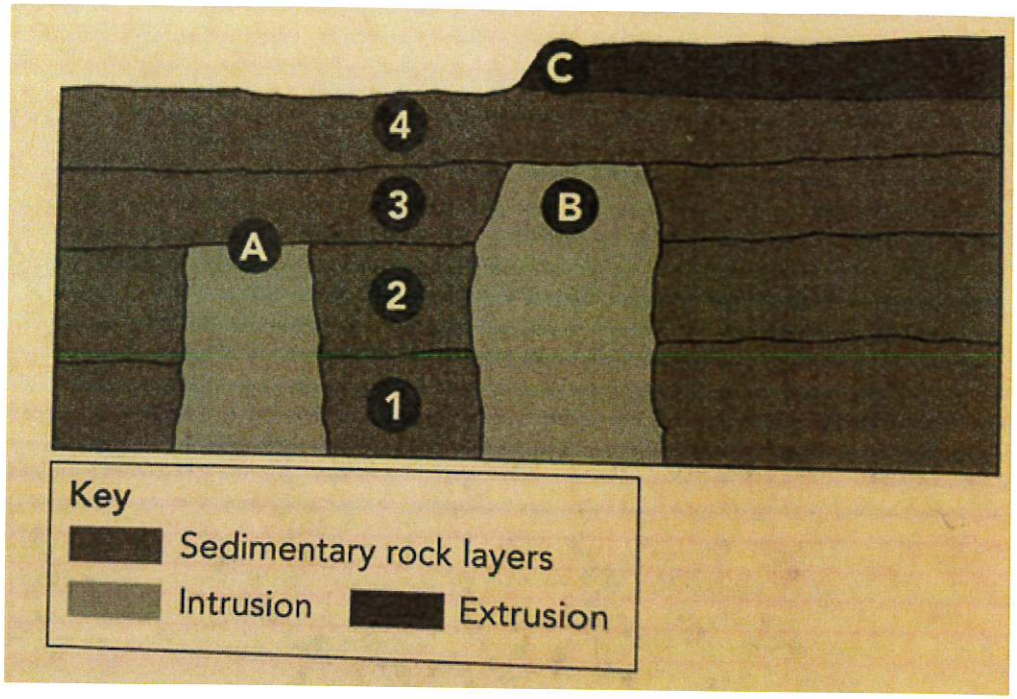
_____

_____

_____

_____

**Use the diagram below to answer question 3**

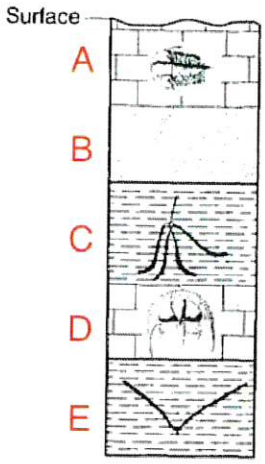



**3.** Write the order in which the rock areas shown formed. Justify your answer using evidence from the diagram.

**EXIT TICKET**

1. In general, what does the law of superposition say that the strata in rock are?
   A. About the same age
   B. Older than the one below it
   C. Older than the one above it
   D. Thicker than the one above it

Use the diagram below to answer questions 2 and 3

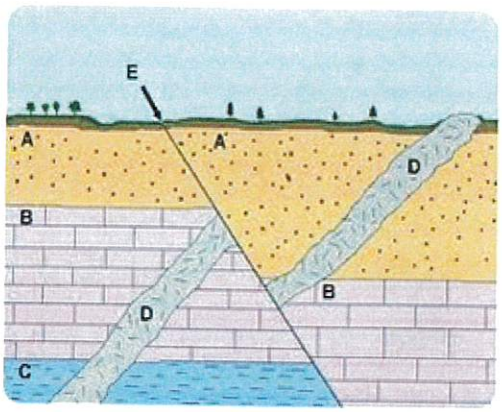



2. In which strata would you expect to find the youngest rocks?
   A. Layer B
   B. Layer C
   C. Layer D
   D. Layer E

3. Which of the following statements correctly compares rock strata C and E?
   A. Rock strata C and E are made of the same materials
   B. Rock strata C and E are similar ages
   C. The rock in strata C is older than the rock in strata E
   D. The rock in strata C is younger than the rock in strata E

4. Explain how scientists can use the strata in sedimentary rock to tell time.

Use the diagram below to answer questions 5-7




5. What does "D" represent in the diagram above?
   A. A sedimentary rock layer
   B. A fault in rock strata
   C. An intrusion in rock strata
   D. A fossil in rock strata

6. What does "E" represent in the diagram above?
   A. A sedimentary rock layer
   B. A fault in rock strata
   C. An intrusion in rock strata
   D. A fossil in rock strata

7. Using your knowledge of relative dating, list the letters A-E in order from oldest to youngest. Use evidence from the diagram to explain your answer.