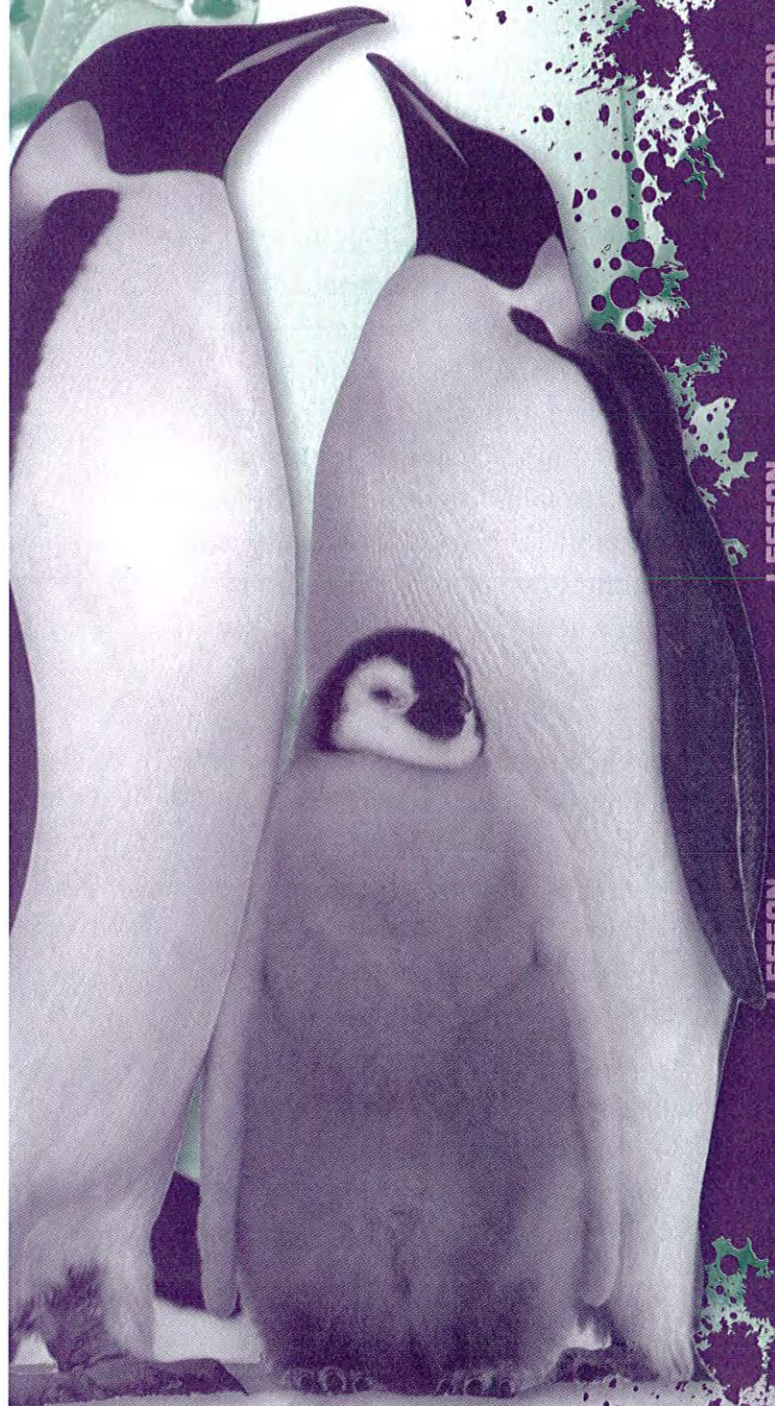


Heredity & Genetics



LESSON

13

A Love of Science

A scientist's study of pea plants yields great discoveries.

adaptation	expression	label
attribute	generation	selection
denounce	heredity	trait
emerge		

LESSON

14

Seeing Double

A girl describes what it is like to be a twin.

approximate	gene	link
contribute	inherit	outcome
critical	instance	utilize
division		

LESSON

15

The Science of Genetics

A timeline provides a brief history of the science of genetics.

data	interview	noteworthy
determine	intricate	predicament
dictate	marvel	remove
intervene		

A Love of Science

<biography>



Have you ever been so disappointed that you thought you'd never get over it? Gregor Mendel is one person who suffered a major setback, yet his life story proves it's possible to emerge from disappointment happier than ever.

Mendel was born in 1822, in what is now the Czech Republic. From an early age, he loved science. Sadly, he failed an important exam that would have allowed him to become a science teacher. Mendel refused to label himself a failure, however, and would not let this disappointment keep him from a life of science. He decided he would do scientific research on plants in his garden instead.

In 1856, Mendel began studying how a physical attribute, or trait, is inherited in plants. Other scientists at that time suggested that traits

passed on from one generation to the next combined to form a new and different trait. Mendel didn't think this was true. Looking at the pea plants in his garden, he saw plants with either purple flowers or white flowers, and plants with either long stems or short stems. He *never* saw any pea plants with purplish-white flowers on medium-sized stems.

For eight years, Mendel worked on the selection, breeding, and study of tens of thousands of pea plants. He discovered that specific traits appeared, disappeared, or reappeared in a generation but that the traits *never* combined. This is also true for animals and humans. It explains why a parent with blue eyes and a parent with brown eyes might have a child with either blue eyes or brown eyes—but not a child who has both one brown eye and one blue eye.

In 1866, Mendel published his findings. Scientists did not denounce his research—instead, they just never read it. Mendel died in 1884, hoping that someday scientists would praise him. In 1900, scientists finally read Mendel's study, and that's when they recognized the importance of his work. Today, Mendel is considered the father of genetics, the study of genes and heredity. Clearly, Mendel's revolutionary work was an expression of his love for science. However, it was his adaptation to an early failure that led to his later success.

Right: Mendel's important study of pea plants and genetics did not become popular until after his death.

VOCABULARY

emerge	selection
label	denounce
attribute	heredity
trait	expression
generation	adaptation

TALK ABOUT IT

With a partner, answer the questions below. Use as many of the highlighted words in the selection as you can.

1. How was Mendel's work on pea plants an *expression* of his love of science?
2. What might be a *physical attribute* of a plant? How many are you able to name?




40 *Hygenelaber*

Pflanzen-...


von
Gregor Mendel.
(Abgedruckt in den *Vorträgen* vom 8.
Einleitende *Bemerkungen*

Einfache *Befruchtungen*, welche im Jahre
genommen wurden, um eine *Lehre*
sowie die *Vererbung* zu den
beobachtet werden sollen. Die *Ergebnisse*
mit welcher *Einigkeit* *Hygenelaber*
so oft die *Befruchtung* *größer* *gleich*
die *Ergebnisse* zu *erwarten* *Ergebnisse*
es aus, die *Entwicklung* der *Hygenelaber*
was zu *erwarten*

Dieser *Einigkeit* *haben* *prägnante* *Ergebnisse*
Ergebnisse, *Herbert*, *Lecoq*, *Nicholas*
mit *ausgewählten* *Ergebnisse*
der *Gärtner* in *privaten* *Arbeiten*
Ergebnisse *Ergebnisse* *Ergebnisse*
in *ausgewählten* *Ergebnisse* *Ergebnisse*
Nun *Ergebnisse* *Ergebnisse* *Ergebnisse*
Ergebnisse *Ergebnisse* *Ergebnisse*
Ergebnisse *Ergebnisse* *Ergebnisse*
Ergebnisse *Ergebnisse* *Ergebnisse*
Ergebnisse *Ergebnisse* *Ergebnisse*

 **Watch** a video introduction for each word

 **Listen** to iWords

 **Refer** to the online dictionary

Word Meanings

For each highlighted word on pages 142–143, the meaning is given below. For practice with other meanings, see pages 147–149. For synonyms and antonyms, see page 172.



1. **emerge**
(i-MURJ)
(v.) When turtles *emerge* from the pond, they come out of the water.
2. **label**
(LAY-buhl)
(v.) When you *label* something, you describe or name it with a word or phrase.
(n.) A *label* is used to identify or describe an object or a picture.
3. **attribute**
n. (A-truh-byoot)
v. (uh-TRI-byoot)
(n.) An *attribute* is a characteristic associated with a person or object, such as eye color or roughness, that comes from nature or habit.
(v.) When you *attribute* your success to someone or something, you explain the reason that you succeeded or give credit for it.
4. **trait**
(trayt)
(n.) A *trait* is a distinguishing quality someone has, such as loyalty. It can also be a physical characteristic, such as curly hair.
5. **generation**
(jen-uh-RAY-shuhn)
(n.) Parents are one *generation* or group that was born and lives at the same time, and their children are the next *generation*.
(n.) The *generation* of something, such as energy, is the process of producing it.
6. **selection**
(suh-LEK-shuhn)
(n.) A *selection* is a choice. When you make a book *selection*, you choose a particular book to read.
7. **denounce**
(di-NOUNSS)
(v.) When people *denounce* someone's work, they criticize it publicly and strongly.
8. **heredity**
(huh-RE-duh-tee)
(n.) *Heredity* is the passing down of genetic characteristics from ancestors to their descendants. When you talk about *heredity*, you say which characteristics you got from your parents and other ancestors.
9. **expression**
(ek-SPRE-shuhn)
(n.) An *expression* of your ideas is how you tell or relate your ideas and feelings to others. You can communicate an *expression* through words, in art, or in music.
(n.) You can reveal how you feel by the *expression* on your face or in the tone of your voice.
10. **adaptation**
(a-dap-TAY-shuhn)
(n.) An *adaptation* can be an adjustment in behavior or attitude.
(n.) An *adaptation* is a physical change that helps an animal survive in a changing environment.

Word Talk

Each lesson word has been placed in a category. With a partner, discuss and list items that belong in each category. Compare your results with those of another pair of students.

Forms of *Expression*

Examples of
Personality *Traits*

*Selections You've
Made Today*

*Ways to Denounce
Something*

*Physical Attributes
of Your Best Friend*

*Places to
Emerge From*

*Items That You May
Need to Label*

*Situations That
Require an
Adaptation*

*Names for a
Generation*

*Characteristics a
Person Gets Through
Heredity*

Check for Understanding

Choose the lesson word that completes each sentence. Write the word on the line provided. Some words will be used twice.

adaptation	emerge	label
attribute	expression	selection
denounce	generation	trait
	heredity	



- Grandmother welcomed a new _____ when her first great-grandchild was born.
- The store had such a wide _____ of winter coats, I had trouble making a choice.
- All workers will have to make a/an _____ to the new schedule, now that they have only thirty minutes for their lunch break.
- After the long trip, we will _____ from the bus tired and hungry.
- Above-average height is a/an _____ of my family.
- There are several interesting classes being offered, so we will have to make a/an _____ after reading the catalog.
- Her shyness is a/an _____ she has worked hard to overcome.
- The politician plans to _____ his opponent's policies on television.
- My unusual eye color is a result of _____.
- One thing that has been passed down to each _____ is my relatives' tradition of telling stories.
- After the exhibit is set up, we will need to _____ all of the displays.
- Your photos are a wonderful _____ of how you see the world.

Expand Word Meanings

Read the paragraph below to learn other meanings for some of the lesson words.

Roses are not blue in nature. That color is not a natural adaptation to the flower's environment. Yet the generation of a blue rose has occupied scientists and rose breeders for a long time. Now biochemist Fred Guengerich and his team of scientists think there may be a way to create blue roses. They produced blue-spotted rose stems by inserting human liver genes into the plants. The expression on their faces must have been amazement when they saw the first blue spot! The scientists attribute their success to years of hard work. If they ever sell blue-rose seeds, the label on the package might read "The First True Blue Rose."

Some of the lesson words are used in a different way on this page. Look at *adaptation*. Here it refers to a physical change, as opposed to a change in behavior or attitude. Look at the other highlighted words. Can you figure out the meaning of the words as they are used here? Refer to page 144 to confirm meanings.

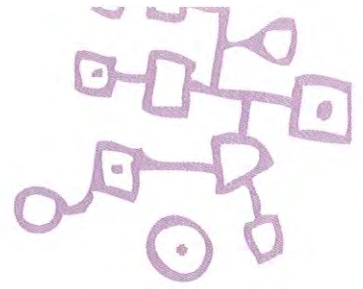
Apply Other Meanings

Complete each sentence with a highlighted word from the paragraph above.

1. Check the nutrition _____ on that bag of trail mix to see how much salt it contains.
2. The large ears on the desert fox are a/an _____ that helps the animal shed heat.
3. Your excited _____ tells me that you have big news to tell us.
4. Some scientists believe that zebras' stripes are a/an _____ that developed over many years to make it difficult for lions to see individual zebras in a herd.
5. The _____ of energy from a lightning strike is immense.
6. I need to put a/an _____ on each file so I know what's inside.
7. I _____ my ability to do math problems without pencil and paper to constant practice.
8. Because Fatima read with great _____, she made the poem exciting.
9. We _____ the low attendance at the concert to the bad weather.
10. The cheerleaders know that the _____ of excitement in the crowd is what makes the game much more fun.

LESSON 13 Word Associations

Use what you know about the lesson word in italics to answer each question. Circle the letter next to the phrase that best answers the question. Be prepared to explain your answers.



- Which group represents more than two *generations*?
 - sister, brother, dog
 - grandmother, father, daughter
 - niece, nephew, aunt
- What is something that is part of your *heredity*?
 - homework
 - vacations
 - musical talent
- Which *expression* would you use to show approval?
 - grin
 - frown
 - blink
- What is considered a positive *trait*?
 - complaining
 - cheerfulness
 - nervousness
- What will eventually *emerge* from a cocoon?
 - egg
 - chocolate
 - butterfly
- Which *adaptation* would help an animal survive in a forest?
 - bright colors
 - blue eyes
 - dark fur
- What is NOT an example of a *selection* someone might make?
 - parents to have
 - movie to see
 - meal to order
- Which group would most likely *denounce* increased highway tolls?
 - students who walk to school
 - commuters who drive to work
 - pilots who fly over roads
- Which of these is an *attribute*?
 - home address
 - hair color
 - school grades
- What is something you would *label* with your name?
 - backpack
 - speech
 - handwriting



Check Again

Use what you know about the lesson word in italics to complete each sentence. Be sure your sentences make sense.

1. If I *denounce* what someone writes, I _____

2. An *adaptation* that can help animals survive is _____
3. Something that may be passed down from one *generation* to another is _____

4. A *selection* I recently made is _____

5. One way to show an *expression* of your ideas is _____
6. I think my best *attribute* is _____
7. A *trait* that distinguishes me from my friends is _____
8. Three things I always make sure I *label* are _____
9. Some examples of how *heredity* is expressed in families are _____

10. One thing I have seen *emerge* in nature is _____

Challenge Yourself

Follow the directions to write sentences with the lesson words in italics. Be sure your sentences make sense both grammatically and in meaning.

Write
Your Own

1. Write a sentence with the word *selection* in the fourth position.
2. Write a sentence exactly eleven words in length using the word *expression*.
3. Write a sentence using the word *heredity* to describe what effect it has on a person.

Word-Solving Strategies: Context Clues

Antonyms

Sometimes, authors help you define an unfamiliar word with an antonym. Reread these sentences from “A Love of Science.”

Scientists did not denounce his research—instead, they just never read it. Mendel died in 1884, hoping that someday scientists would praise him.

The word *praise* in the second sentence helps readers know that **denounce** means the opposite, because the two words are antonyms.

Words that may signal an antonym include *otherwise, whereas, rather than, and as opposed to*. Here is an example:

Matilda hoped her friends would support rather than criticize her decision.

Note that writers do not always include clues to antonyms. You will need to pay attention to the context to find a contrasting word.

BE CAREFUL!

Practice

A. Write each highlighted word and its antonym in the first two boxes. Use context clues to write another meaning for the word in the third box.

One of the most **distinct** birds in the wild is the penguin, because its breeding habits are not typical for birds. Penguins mate with the same partner for life. Every breeding season, female penguins lay one egg. Then the male penguin sits on the egg to incubate it while the female goes off to get food. Both the male and the baby chick would **perish** if the mother didn't bring back enough food. They could not survive without her. Although this **singular** arrangement is not common, it works well for penguins.

WORD

ANTONYM

WORD MEANING

B. Write a sentence for each of the highlighted words from the paragraph above. Use an antonym as a context clue. You will use one word twice.

1. _____
2. _____
3. _____
4. _____

Practice for Tests

Fill in the bubble next to the answer that best completes the sentence or answers the question.

1. Read this sentence.

The team was quick to *attribute* its win to the training from the coach.

Attribute means:

- A give credit for
- B characteristics
- C succeed
- D category

2. Which pair represents more than one *generation*?

- A sister/brother
- B aunt/uncle
- C mother/father
- D grandparent/parent

3. Making a *selection* means making:

- A a list
- B an announcement
- C a choice
- D a plan

4. Which of the following is NOT a *trait*?

- A high grades
- B gracefulness
- C quietness
- D sense of humor

5. A word closely associated with *emerge* is:

- A shrink
- B retreat
- C exit
- D maintain

6. Read this sentence.

She made a speech to *denounce* the company's policies.

Denounce means:

- A praise
- B question
- C explain
- D criticize

7. When people make an *adaptation* to a situation, they may change all except:

- A the location
- B what happens
- C their attitude
- D their clothes

8. *Heredity* refers to what you get from:

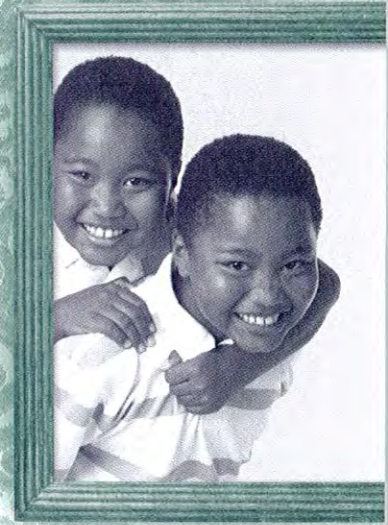
- A your parents
- B your friends
- C your school
- D your environment

9. What could you learn from a *label*?

- A directions to a place
- B schedule of classes
- C description of an object
- D names of performers

10. An example of a facial *expression* is:

- A a joke
- B a smile
- C laughter
- D a photo



Seeing Double

<personal narrative>

When people ask if I like being a twin, my usual answer is “*Most of the time!*” When we were kids, every day seemed special to my twin sister, Angel, and me because we enjoyed each other’s company so much. We looked so similar that it was always easy to fool people, and when we played practical jokes, we’d laugh until we nearly cried.

However, I wasn’t always happy about sharing, and sometimes I wished we weren’t so competitive. For instance, if I ran a mile, Angel would run two. If she got a good grade, I had to get a better one. Yet, in spite of everything, these experiences contribute to the person I have become, and they link me to my sister.

When I was little, I always wondered what made us twins, but it wasn’t until I was eight that I learned the answer. My parents explained that Angel and I were the outcome of the division, at our conception, of a single egg. That’s why almost every gene that twins inherit is the same. The majority of twins are not identical, though. Most are fraternal, which means that two separate eggs were fertilized at the time of their conception.

There are so many critical ways in which Angel and I are similar. We’re both creative and understand each other’s thoughts and feelings. We both love animals, too. On the other hand, we’re also different, because she’s taller and

VOCABULARY

instance gene
contribute inherit
link critical
outcome approximate
division utilize

quiet while I'm a little shorter and more social. She loves to play piano; I love to paint.

Recently I told Angel about the Twins Day Festival in Twinsburg, Ohio. She had never heard of it. I described the parade, contests, speakers, and fireworks, and how festival organizers approximate that more than one thousand twins will attend. I asked if she wanted to go with me. Fortunately, I didn't have to utilize my powers of persuasion. Just as I hoped she would, Angel asked the right question: "When can we go?"

TALK ABOUT IT

With a partner, answer the questions below. Use as many of the highlighted words in the selection as you can.

1. What do you think will be the *outcome* of the Twinsburg trip? Do you think the twins will have fun? Explain.
2. What do you think the author felt about having to share with her sister? Think of an *instance* when you had to share something. How did you feel?



LESSON
 14

Word Meanings

For each highlighted word on pages 152–153, the meaning is given below. For practice with other meanings, see pages 157–159. For synonyms and antonyms, see page 172.

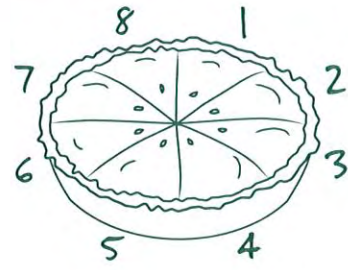
1. **instance**
(IN-stuhns)
 2. **contribute**
(kuhn-TRI-byoot)
 3. **link**
(lingk)
 4. **outcome**
(OUT-kuhm)
 5. **division**
(di-VI-zuhn)
 6. **gene**
(jeen)
 7. **inherit**
(in-HE-rit)
 8. **critical**
(KRI-tuh-kuhl)
 9. **approximate**
v. (uh-PROK-si-mayt)
adj. (uh-PROK-si-muht)
 10. **utilize**
(YOO-tuh-lize)
- (n.) An *instance* is an example that illustrates or explains what you are talking about.
- (v.) People who *contribute* to a cause will give their time, effort, or money.
- (v.) When you *link* things or people, you connect them or bring them together.
(n.) A *link* is something that connects two things, such as a *link* in a chain.
- (n.) When you know the *outcome* of something, you know the result or what happened.
- (n.) The act of *division* involves separating something into parts.
(n.) When people experience a *division*, their interests or opinions are separate and have little in common.
- (n.) A *gene* in a person's body carries information about one or more traits the person gets from his or her parents.
- (v.) You *inherit* from your parents information in your genes that determines how you look and act.
- (adj.) A person who is *critical* to a project is important and necessary for it to be a success.
(adj.) Someone who is *critical* of another person finds fault and flaws.
- (v.) When you *approximate*, you try to make a guess that will come close to the actual number, such as when you *approximate* the number of people who will attend an event.
(adj.) Something that is *approximate* is very close or almost exact.
- (v.) When you *utilize* something, you make use of it.



Word Talk

Each lesson word is listed here. With a partner, take turns drawing a picture to illustrate the meaning of six of the words. As one partner draws, the other partner identifies the vocabulary word.

approximate (v.)
contribute
critical
division
gene
inherit
instance
link (v.)
outcome
utilize



division

Check for Understanding

Choose the lesson word that completes each sentence. Write the word on the line provided. Some words will be used twice.

approximate	division	link
contribute	gene	outcome
critical	inherit	utilize
	instance	

- Each _____ in the body contains a code that tells what we are made of.
- Both the Internet and the telephone _____ people from different places around the world.
- I was sure of the _____ of the race before it was over, because I knew how hard our team had been training.
- Many people _____ to our school fair by volunteering or donating supplies.
- The Quiz Bowl began with the _____ of the class into equal teams.
- I hope my dog's puppies _____ her calm disposition and friendly manner.
- Our science teacher explained that penguins are a/an _____ in nature when fathers are the babies' primary caregivers.
- Try to _____ how many minutes it will take to proofread your essay.
- We can _____ these old pieces of wood to build a new doghouse.
- Local businesses will _____ money to buy uniforms for our team.
- Let's _____ our rafts together and float down the river in a group.
- This hammer and nail are _____ to getting the picture hung on the wall.



Expand Word Meanings

Read the paragraph below to learn other meanings for some of the lesson words.

Scientists studying twins have made some interesting discoveries. They say there may be a **link** between where a woman lives and her age, and whether she has fraternal twins. There may even be a connection to what a woman eats. And scientist Carl Bruder has been **critical** of the idea that identical twins are completely the same. He believes that even though the **division** between fraternal twins is more obvious, identical twins are different, too. He conducted a study that showed that identical twins aren't exactly the same. In fact, a better name for identical twins might be **approximate** twins!

I In this passage, you will see that some of the lesson's words are used in a different way. For example, see how the word *link* is used as a noun instead of a verb. Look at the other highlighted words. Can you figure out the meanings of the words as they are used here? Refer to page 154 to confirm meanings.

Apply Other Meanings

Complete each sentence with a highlighted word from the paragraph above.

1. In our study group, there was a/an _____ of opinion regarding which topic we should focus on first to prepare for the test.
2. My mother wanted to know the _____ number of people who were coming to my graduation party so she could buy enough refreshments.
3. We discovered a/an _____ between the temperature and the number of insects we saw in the garden.
4. When there is a/an _____ between lawmakers, little gets done in government.
5. My sister was _____ of my choice of clothing for our cousin's wedding.
6. Researchers have found a/an _____ between drinking sugary beverages and obesity.
7. The _____ distance between my house and my school is two miles.
8. I asked my father to be very _____ as he read my research project, because I knew his suggestions would help make it the best paper I'd ever written.
9. Many people believe there is a/an _____ between the full moon and people's odd behavior.
10. My boss was _____ of my work and asked that I rearrange the items on the shelf.

Word Associations

Use what you know about the lesson word in *italics* to answer each question. Circle the letter next to the phrase that best answers the question. Be prepared to explain your answers.



- When do you learn the *outcome* of a story?
 - in the beginning
 - at the end
 - in the middle
- Which person would be least *critical* at the scene of an accident?
 - eyewitness
 - police officer
 - tow truck driver
- Which of these is the *approximate* number of days you have been alive?
 - 4,300
 - 100,000
 - 365
- Which step in making a layer cake involves *division*?
 - putting frosting on the cake
 - mixing ingredients together
 - pouring the batter into three pans
- Which characteristic would you be most likely to *inherit* from your parents?
 - interest in sports
 - fingerprints
 - eye color
- Which item would you *utilize* when building a doghouse?
 - dog
 - computer
 - hammer
- Which pair would show each *gene* as nearly identical?
 - twin sisters
 - a brother and a sister
 - brothers ages 11, 10, and 9
- Which item would help *link* friends who live far apart?
 - a diary
 - a phone
 - a radio
- Which item shows an *instance* of good sportsmanship?
 - leaving the playing field
 - shaking hands with the other team
 - playing the other team
- How can a student *contribute* to the community?
 - volunteer
 - take a walk
 - leave



Check Again

Use what you know about the lesson word in italics to complete each sentence. Be sure your sentences make sense.

1. A trait that people may *inherit* from their parents is _____
2. If you needed to give a description of someone, it would be helpful to guess his or her *approximate* _____
3. One reason someone may be *critical* to a project is _____

4. When planning a research paper, you will likely *utilize* _____

5. People *contribute* their time to charities because _____

6. A defective *gene* can cause _____
7. An *instance* of when it's a good idea to find shelter is _____
8. You can control the *outcome* of a project by _____
9. A way to *link* people who are interested in the same things is to _____
10. One thing that might cause a *division* among people in a group is _____

Challenge Yourself

Follow the directions to write sentences with the lesson words in italics. Be sure your sentences make sense both grammatically and in meaning.

*Write
Your Own*

1. Write a sentence with the word *utilize* in the fourth position.
2. Write a sentence exactly fourteen words in length using the word *outcome*.
3. Write a sentence about a way students can *contribute* to their community.

Word-Solving Strategies: Context Clues

Punctuation

Punctuation can provide clues to the meaning of unfamiliar words. Reread this sentence from “Seeing Double.”

The majority of twins are not identical, though. Most are fraternal, which means that two separate eggs were fertilized at the time of their conception.

The comma after *fraternal* sets off text that helps you to understand the word’s meaning. Quotation marks, dashes, parentheses, and brackets may also signal a definition.

Punctuation is often used as a clue to a word’s meaning, but read carefully. The author may also use punctuation as part of his or her style.

Katrinka walked onto the stage—silence—and began to sing.

BE CAREFUL!

The dashes here are for dramatic effect. Consult a thesaurus for help with unfamiliar words.

Practice

A. Write a highlighted word and the punctuation clue to its meaning in the first two boxes. Write a meaning for the word in the third box.

Many stories feature twins, but my favorite is about two boys who look alike but aren’t twins. In this book by Mark Twain, one boy is a prince and the other boy is a pauper—a person living in extreme poverty. The poor boy is subordinate, or considered lower than everyone else. The prince is of high rank, which means he is in an “important social position” and has everything done for him. However, they have one thing in common: they both want to alleviate (lessen) suffering wherever they see it.

WORD

PUNCTUATION

WORD MEANING

B. Write a sentence for each of the highlighted words from the paragraph above. Use punctuation clues.

1. _____
2. _____
3. _____
4. _____

Practice for Tests

Fill in the bubble next to the answer that best completes the sentence or answers the question.

1. Read this sentence.

The director was *critical* of the actor's poor performance.

Critical means:

- A judgmental
- B important
- C crucial
- D approving

2. Which is dangerous to *approximate*?

- A amount of flour in a recipe
- B number of World War II soldiers
- C height of a mountain
- D dose of medicine to take

3. When you *inherit* something, it is:

- A paid for by a friend
- B sent by mail from a relative
- C passed down to you
- D assigned by your teacher

4. More than one *gene* can be found in:

- A every cell of your body
- B a computer code
- C your closet
- D your personality

5. A word closely associated with *instance* is:

- A situation
- B quickly
- C example
- D complete

6. Read this sentence.

Our teacher wants us to *utilize* our imaginations when writing the story.

Utilize means:

- A control
- B ignore
- C increase
- D use

7. People who *contribute* time and help to a community project are:

- A consumers
- B volunteers
- C testers
- D neighbors

8. A *division* of effort for a job involves:

- A giving each person a task
- B having everyone work together
- C doing the work in different places
- D not working for part of the day

9. When people find a *link*, they:

- A pull away from each other
- B work side by side
- C discover what they share
- D refuse to speak to each other

10. To get the best *outcome* for a job, you:

- A rewrite directions
- B follow directions
- C decide where to begin
- D start in the middle

The Science of Genetics

<timeline>

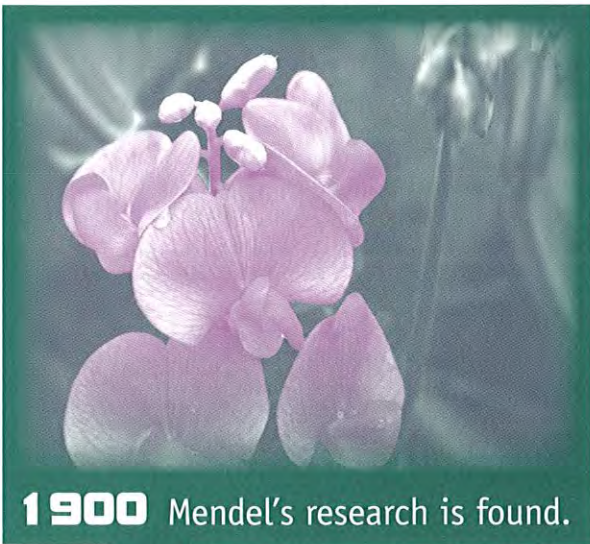
Are you a born athlete or a singer? Are your eyes brown, blue, or green? If you are curious about the science behind the traits you've inherited, read on. Recent scientific advances offer us fascinating answers and the possibility of a healthier and happier tomorrow. Here is a brief history of the science of genetics.

1900 Scientists rediscover Gregor Mendel's ground-breaking research, which had been published in 1866, then ignored. For eight difficult years, Mendel had studied plants, seeking to understand how traits are inherited.

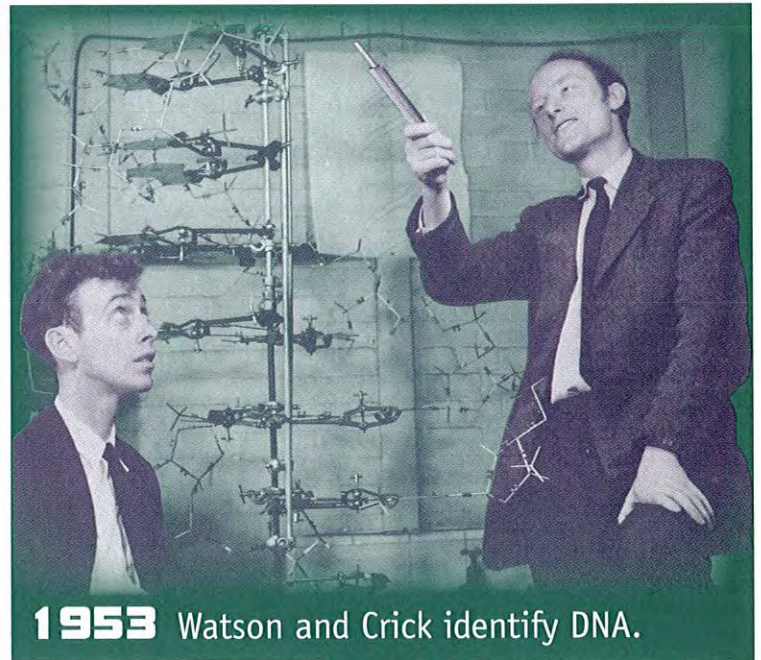
1953 James Watson and Francis Crick identify how genes are linked together to provide genetic instructions. They call these intricate strands DNA and admire their beauty.

2003 Scientists achieve their goal of gathering data on all the strands of human DNA. In 1990, eighteen countries from around the world joined with the United States to begin this work. Called the Human Genome Project, it is one of the largest and most noteworthy scientific research projects in history. It takes thirteen years and three billion strands of DNA before researchers finish this important task.

Today Interview a scientist now and you'll quickly determine that studying genetics has changed our world. Scientists marvel at all they have learned and at the many ways it will benefit people. Researchers have identified genes that cause certain traits and others that



1900 Mendel's research is found.



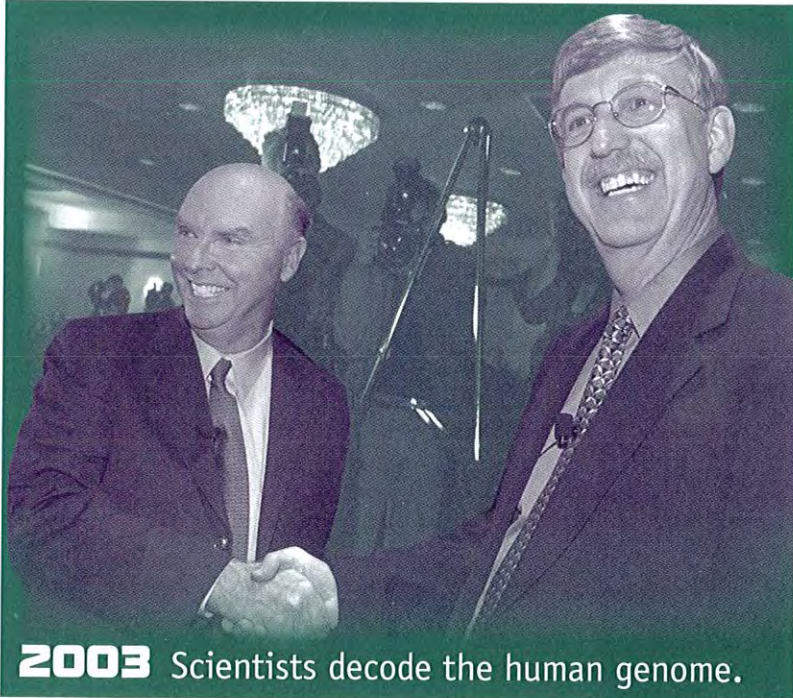
1953 Watson and Crick identify DNA.

VOCABULARY

intricate	marvel
data	predicament
noteworthy	remove
interview	intervene
determine	dictate

can cause diseases. For people caught in the predicament of inheriting disease-causing genes, this is good news. It may remove their concern, because genetic information helps scientists to research cures. It also enables them to intervene to prevent diseases from even occurring. Scientists have discovered how to reproduce identical animals, such as Dolly the sheep, Copy Cat the cat, and Ralph the rat. Researchers continue to learn more about genes by studying these animals.

The science of genetics has an exciting future, but its complexities dictate that we be thoughtful as we move forward.



2003 Scientists decode the human genome.

TALK ABOUT IT

With a partner, answer the questions below. Use as many of the highlighted words in the selection as you can.

1. Would you like to *interview* a genetic scientist? What questions would you ask?
2. Which event in this timeline do you think is the most *noteworthy*? Why?



Today Research continues.

Word Meanings

For each highlighted word on pages 162–163, the meaning is given below. For practice with other meanings, see pages 167–169. For synonyms and antonyms, see page 172.

1. **intricate** (IN-truh-kit) (adj.) An *intricate* machine is one with many complex and interrelated parts.
2. **data** (DAY-tah) (n.) When you gather *data*, you collect facts about a topic.
3. **noteworthy** (NOHT-wur-~~t~~hee) (adj.) If someone is *noteworthy*, she or he has done or contributed something that is important enough to attract attention.
4. **interview** (IN-tur-vyoo) (v.) When you *interview* someone, you talk to the person and ask questions in order to gather information.
(n.) An *interview* is a meeting in which someone questions another person to gather information or to decide on his or her qualifications for a job.
5. **determine** (di-TUR-min) (v.) To *determine* something is to make a decision or come to a conclusion. When you *determine* the answer to a question, you decide what is correct.
6. **marvel** (MAR-vuhl) (v.) People who *marvel* at something are filled with surprise, wonder, and amazement.
(n.) A *marvel* is someone or something that causes astonishment or wonder.
7. **predicament** (pri-DI-kuh-ment) (n.) A *predicament* is a perplexing or difficult situation.
8. **remove** (ri-MOOV) (v.) When you *remove* something, you move, shift, or take it away.
(v.) You can *remove* something by getting rid of it completely.
9. **intervene** (in-tur-VEEN) (v.) When you *intervene* in an event, you change or hinder the outcome.
10. **dictate** (DIK-tayt) (v.) When you *dictate* to someone, you speak with authority and impose or give an order.
(n.) A *dictate* is a ruling principle or command, such as the ideas your conscience follows.



Word Talk

Each lesson word has been placed in a category. With a partner, discuss and list items that belong in each category. Compare your results with those of another pair of students.

Things You Would
Remove for a Small
Child's Safety

Circumstances
That Might Cause a
Person to *Intervene*

Situations That
May Turn into a
Predicament

People Who Might
Dictate Rules

Noteworthy Events
in History

People You Would
Interview to Learn
About Your Town

Events That Would
Cause You to *Marvel*

Devices or Objects
That Are *Intricate*

Things You Might
Need to *Determine*

Data You Might
Collect in a Survey

Check for Understanding

Choose the lesson word that completes each sentence. Write the word on the line provided. Some words will be used twice.

data	intervene	noteworthy
determine	interview	predicament
dictate	intricate	remove
	marvel	

- The honor student received an award for her _____ accomplishment.
- The emperor had an overbearing manner that caused him to _____ commands to everyone around him.
- I plan to _____ three people today for the job.
- We _____ that you were able to complete the job so quickly and so well.
- The pattern in this cloth is quite _____ and complex.
- We have a/an _____ because we can't choose which of the two candidates should be our leader.
- The argument became so heated that someone had to _____ before a fight started.
- A spider's web is one of the most _____ structures in nature.
- We need to _____ the tables and chairs from the room before the dance begins.
- One of the most _____ people in history is the inventor of the telescope.
- We have collected all the _____ we need through our survey.
- You need to _____ whom you want to invite to the party.



Expand Word Meanings

Read the paragraph below to learn other meanings for some of the lesson words.

Every day, scientists who study genetics learn more about the human body. Their discoveries are a **marvel** to us all. One fascinating subject is "broken genes." These are genes that don't form correctly. Red hair is a physical trait that occurs when there are two broken genes. I read an **interview** with a scientist whose **dictate** is to study these special genes. He said, "Because you cannot **remove** broken genes, some of them will cause disorders." He explained that broken genes can affect how the body processes salt and may also play a role in cancer. He hopes that researching broken genes may lead to a cure for cancer.

Some of the lesson's words are used in a different way in this passage. For example, look at the word *interview*. Here it's used as a noun to mean a question-and-answer conversation. Can you figure out the meanings of the other highlighted words as they are used here? Refer to page 164 to confirm meanings.

Apply Other Meanings

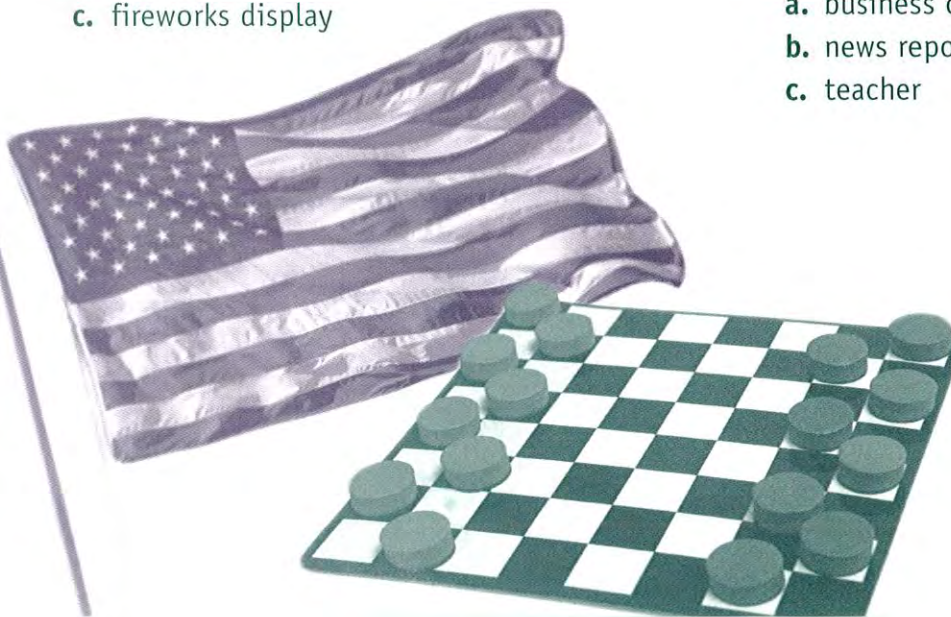
Complete each sentence with a highlighted word from the paragraph above.

1. The eclipse of the sun was a/an _____ to see.
2. Noelle will conduct a/an _____ with the new teacher and then write an article about him for the school newspaper.
3. Jill had to _____ the broken eggshells from the bowl before she could mix the cake batter.
4. The exhibit of moon rocks at the space museum was so interesting, my aunt described it as a/an _____.
5. The town issued a/an _____ that residents must shovel their sidewalks in winter.
6. The news reporter planned a/an _____ with someone who witnessed the crime.
7. Our _____, as employees, is to make sure this company is profitable.
8. The doctors declared the surgery a success because they were able to _____ the tumor from the patient's leg.
9. I think that the new aquarium is a/an _____ because it has so many different kinds of fish on display.
10. There is a/an _____ on television tonight with the scientist who discovered a comet.

Word Associations

Use what you know about the lesson word in *italics* to answer each question. Circle the letter next to the phrase that best answers the question. Be prepared to explain your answers.

- Which item has an *intricate* design?
 - a flag
 - a snowflake
 - a checkerboard
- What do you need to *determine* before you choose an answer to a question?
 - which answer is the most unusual
 - which answer is the longest
 - which answer makes the most sense
- When you *dictate*, what do you do?
 - command
 - plea
 - question
- At which event would you want someone to *intervene*?
 - concert
 - fight
 - parade
- Which event would people most likely *marvel* at?
 - graduation
 - lecture
 - fireworks display
- Which activity would other people consider most *noteworthy*?
 - feeding a cat
 - petting a sheep's fur
 - training a Seeing Eye dog
- What is another word for *predicament*?
 - problem
 - solution
 - prediction
- Which item would you want to *remove* from a car?
 - a rear-view mirror
 - a flat tire
 - a steering wheel
- What type of *data* about a resident would be most important to a candidate for mayor?
 - his or her name and address
 - whether or not he or she will vote
 - his or her favorite newspaper
- Who would probably be the person to *interview* you for a job?
 - business owner
 - news reporter
 - teacher



Check Again

Use what you know about the lesson word in italics to complete each sentence. Be sure your sentences make sense.

1. A *predicament* that some students face is _____

2. Something I frequently have to *remove* from my room is _____
3. Something I always *marvel* at is _____
4. I feel as if I need to *dictate* the rules when I _____

5. A design can be called *intricate* when it has _____
6. When you collect *data* in a survey, you _____

7. An adult will need to *intervene* when _____

8. A book is considered *noteworthy* when _____
9. To *determine* what to wear in the morning, I _____
10. If I were going to *interview* my parents about their childhood, I'd ask _____

Challenge Yourself

Follow the directions to write sentences with the lesson words in italics. Be sure your sentences make sense both grammatically and in meaning.

Write
Your Own

1. Write a sentence with the word *data* in the second position.
2. Write a sentence exactly sixteen words in length using the word *predicament*.
3. Write a sentence about an *interview* with someone famous.

Word-Solving Strategies: Prefixes

Prefix *inter-*: “between,” “among”

You have learned about suffixes and prefixes in previous lessons. Suffixes are word parts that are added to the end of words. Prefixes are word parts that are added to the beginning of roots. When a prefix is added, it changes the meaning of the root. Knowing the meaning of a prefix will help you determine the meaning of the whole word.

The prefix *inter-* means “between” or “among.” Take a look at the word *intervene* from this lesson. The root *ven* means “come.” So when the prefix *inter-* is added, you can say that the word *intervene* means “come between.”

Now look at the word *interview* from this lesson. The root word *view* can mean “observe” or “examine.” When you use what you know about the prefix *inter-*, you could

say that an *interview* between two people is a chance for both people to observe or examine each other.

Examples

Look at these examples of words with the prefix *inter-*. Note how the meaning of the prefix affects the meaning of the word.

interlay → to lay or place between

intermission → a time

between parts
of entertainment

intersection → a place

between two areas
that cross

interlude → time between
acts in a play

interstate → among states

Not all words that begin with *inter-* are necessarily a root word with the prefix *inter-* added. For example, the word *internal* means “inside.” When you are uncertain whether a word has a prefix, try interpreting it with what you know about that prefix. Then see if your meaning makes sense in the context of the sentence.

BE CAREFUL!

Practice

Use what you’ve learned about the prefix *inter-* to suggest a meaning for each of the following words.

1. interoffice _____

2. intercept _____

3. interrupt _____

4. intertribal _____

5. interstate _____

6. interaction _____

7. international _____

8. interpersonal _____

Practice for Tests

Fill in the bubble next to the answer that best completes the sentence or answers the question.

1. Read this sentence.

All the people I talk to *marvel* at our new state-of-the-art sports stadium.

Marvel means:

- A wonder
- B complain
- C gossip
- D play

2. A situation becomes a *predicament* when:

- A a solution is found
- B it has a positive outcome
- C opinions are expressed
- D a problem develops

3. *Data* from a survey can show you:

- A people
- B paper
- C opinions
- D questions

4. An *interview* consists mainly of:

- A questions
- B forms
- C introductions
- D lists

5. A word associated with *noteworthy* is:

- A attentive
- B average
- C excellent
- D forgettable

6. Read this sentence.

We were impressed by the *intricate* plans for the robot.

Intricate means:

- A simple
- B confused
- C clear
- D complicated

7. You would *intervene* in something if:

- A everything was going well
- B someone asked you for help
- C many ideas were presented
- D someone proposed taking a vote

8. You would most likely *remove* something from your home if you wanted to:

- A get rid of it
- B keep it
- C make room for it
- D show it to others

9. Why would someone issue a *dictate*?

- A to ask a question
- B to make an announcement
- C to establish a rule
- D to compliment

10. When you *determine* something, you:

- A reject
- B decide
- C ignore
- D compare

Synonyms and Antonyms

In the following Word Bank, you will find synonyms and antonyms for some of the words in Lessons 13–15. (Remember: Some words have both synonyms and antonyms.) Study these words; then complete the exercises below.

withhold complex crucial praise obey uncomplicated
distinguished mediate consequence unimportant criticize adjustment

A. For each sentence, fill in the blank with a **SYNONYM** for the word in boldface.

1. Ngozi was concerned that her **adaptation** to her new town would be difficult, but the _____ became much easier once she found out the girl next door was her age.
2. We didn't want Mom to **intervene**, but she did and managed to _____ successfully to get us all to agree.
3. We never imagined that salt was a **critical** ingredient in the recipe, but after we left it out, we realized how _____ it was.
4. The **noteworthy** author had a/an _____ academic career before she began writing historical fiction.
5. It may not always be possible to predict the **outcome**, but every action has a/an _____.

B. For each sentence, fill in the blank with an **ANTONYM** for the word in boldface.

6. The discussion leader wanted everyone to **contribute**, but some participants chose to _____ their comments.
7. When bossy people **dictate** their demands, others may _____ but do so with resentment and reluctance.
8. The violinist could play the most **intricate** melodies and make them seem simple and _____.
9. In the early days of air travel, a trip on a plane was a **noteworthy** occasion. Today, it's a pretty _____ event.
10. We expected town officials to **denounce** our idea for a rock concert, but instead they decided to _____ us for showing creativity and initiative.

Word Study: Idioms

If a friend says that you and he are like “two peas in a pod,” he’s not comparing you to a vegetable. What he means is that you’re both very much alike. The phrase “two peas in a pod” is an idiom—a colorful, informal phrase that means something different from the literal meaning of its words.

Some words in Lessons 13–15 can be expressed as idioms. For example, if someone says, “like father, like son” or “she’s the spitting image of her mom,” that person is talking about *traits* (Lesson 13) that people *inherit* (Lesson 14) from their parents.

Practice

Read each sentence. Use context clues to figure out the meaning of each idiom in boldface. Then write the letter of the definition for the idiom.

- | | |
|---|---|
| _____ 1. Enrico has extra time, so he will make hay while the sun shines and study for the test. | a. show surprise or disapproval |
| _____ 2. After an hour of trying to start the lawnmower, I decided to call it quits . | b. person who has authority or power |
| _____ 3. Mrs. Shapiro is a big wheel at the company, because she’s in charge of more than twenty salespeople. | c. remove assistance or support unexpectedly |
| _____ 4. My parents would pull the rug out from under me if they suddenly took away my weekly allowance. | d. a situation in which you must make a difficult choice and won’t be able to please everyone |
| _____ 5. We put two and two together and figured out that rabbits had been eating the vegetables in our garden. | e. take an opportunity to do something before it passes you by |
| _____ 6. I was between a rock and a hard place when I had to either miss my best friend’s graduation or skip Dad’s birthday party. | f. link facts or ideas to figure out what happened |
| | g. stop trying |

Apply

Work with a partner to find out the meaning of each proverb. (Use an online or print dictionary.) Then work together to write a sentence for each item

- | | |
|----------------------------|---------------------------|
| 1. see the light | 5. thank your lucky stars |
| 2. rule the roost | 6. fizzle out |
| 3. piece of cake | 7. off the beaten track |
| 4. put your ducks in a row | 8. rub elbows with |

Vocabulary for Comprehension

Read the following passage, in which some of the words you have studied in Lessons 13–15 appear in boldface type. Then answer questions 1–6.



Eye on the Prize

Few **critical** scientific advances are discovered in isolation. Often, more than one team is working toward the same **outcome**, and it's a race to see who will reach the finish line first.

- 5 When Francis Crick, James Watson, and Maurice Wilkins were awarded the Nobel Prize in 1962 for the discovery of DNA, there was a fourth scientist in the background. It was Rosalind Franklin, who died of cancer in 1958.
- 10 Franklin, with Wilkins, was studying x-ray images of DNA while Crick and Watson were building **intricate** models. In 1951, Watson heard a lecture by Franklin. He was quick to

denounce her **expression** of ideas. However, her ideas led him in a new direction.

- Franklin then found that DNA had the **attribute** of a helix, or spiral. Wilkins wanted to announce this discovery, but Franklin wanted to be sure. Their **division** led Wilkins to share the **data** with Watson and Crick without asking for Franklin's consent. The helix, which was made up of two strands that separated when cells divided, was the key to the work that became a **marvel** to the scientific world. A Nobel Prize can only be awarded to three living people. If Franklin had lived, the **predicament** would have been: Who gets the prize?

1. In sentence 1, **critical** means

- A important
- B disapproving
- C unique
- D ordinary

2. Another word for **outcome** (line 3) is

- A experiment
- B laboratory
- C point
- D goal

3. When people are quick to **denounce** (line 14) someone's ideas, they

- A apologize for an injustice
- B praise the person to others
- C criticize the person
- D ignore the person

4. An **attribute** (line 17) of DNA would be

- A a behavior
- B an emotional reaction
- C a physical characteristic
- D an unusual change

5. When two people experience a **division** (line 19), they

- A learn new information
- B renew their friendship
- C do not agree
- D work well together

6. A **predicament** (line 26) over who is awarded an important prize

- A is easily resolved
- B is not a problem
- C has happened before
- D has no easy solution