



What's In SPACE?

LESSON

1

Why Explore Space?

Citizens of the universe need to know what goes on in space.

asteroid	goals	retreat
demonstrate	meteor	suspend
establish	resolve	treacherous
galaxy		

LESSON

2

The Life Cycle of a Star

Like people, stars experience birth, life, and death.

bond	compress	monitor
coincide	comprise	overall
combustion	luminous	reaction
compound		

LESSON

3

Is There Life on Mars?

Scientists search for signs of life on this nearby planet.

administration	investment	privilege
celestial	orbit	resources
constrained	percentage	satellite
immense		



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Why Explore Space?

<persuasive essay>

Some people wonder why we bother exploring space. They claim that we still have much to learn about our own planet. With so many problems yet to solve, our goals should be related only to Earth. They want us to suspend all activities involving the study of space.

I have an entirely different view. I strongly believe that there are many valid reasons to explore space. Citizens on Earth have to be knowledgeable about space. It's important to be able to distinguish between a star, which is composed of burning gas, and a planet, which is composed of rock. Everyone should understand that planets orbit around stars. We all should know that a meteor and a shooting star are the same thing—a small rock that falls from space and burns as it enters our atmosphere. It's also important to understand that if an asteroid, which is larger than a meteor, fell to the Earth, it would be treacherous. While astronomers no longer consider Pluto a planet, they discover twenty new planets outside our solar system every year. I hope that one day people will know as much about our galaxy and the universe as we do about Earth's continents and oceans.

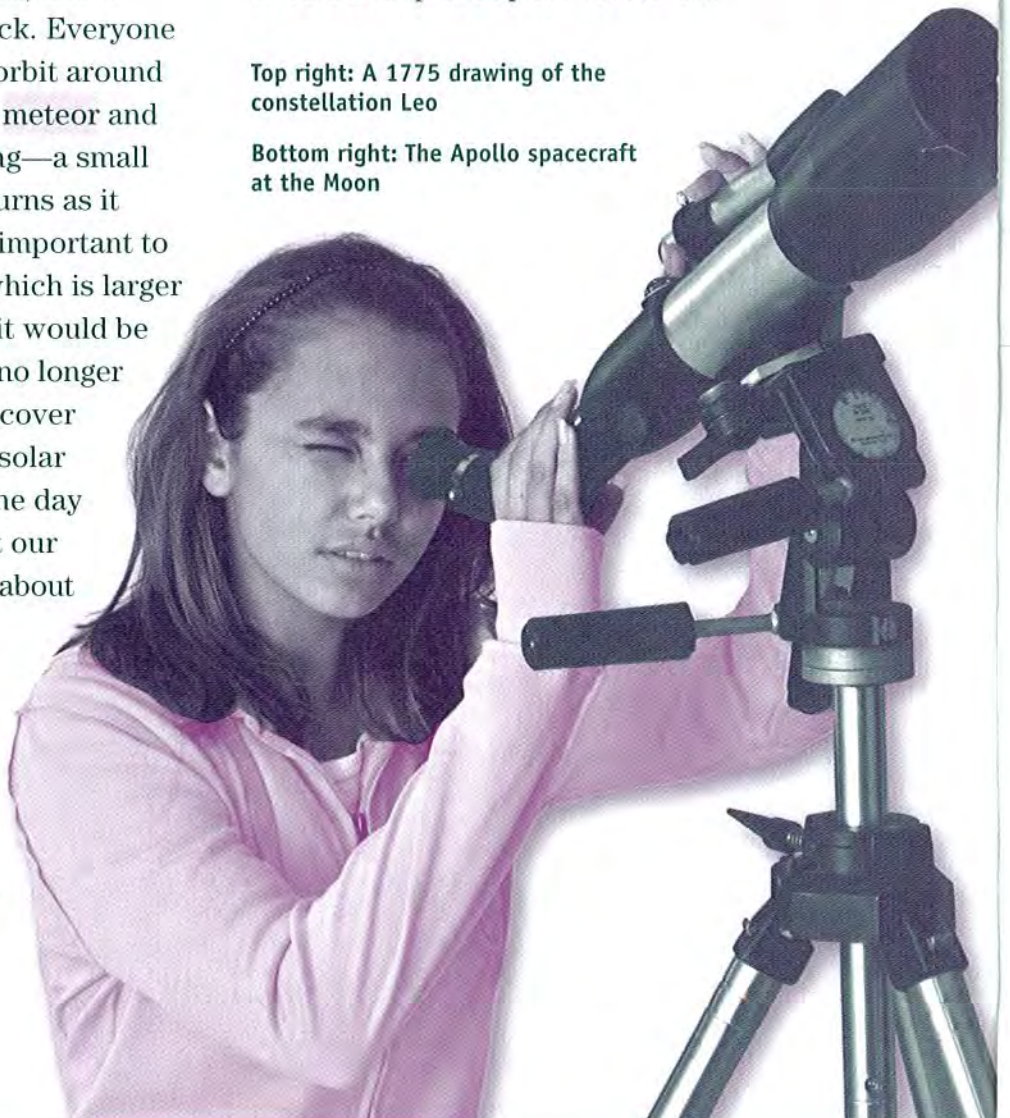
So much of human history is about exploration and discovery. Ever since people first stared out at the sea or looked up at the night sky, we have wanted to

know more. It's human nature to be curious. Someday we might even establish colonies in order to live away from Earth. Space exploration provides an ideal opportunity to demonstrate how countries around the world can unite around common goals. Exploring space is an investment in our future.

Therefore, I ask that we all resolve to become more-knowledgeable citizens of the universe. We must not retreat from this promise. We need to educate ourselves today so that more of us can explore space tomorrow.

Top right: A 1775 drawing of the constellation Leo

Bottom right: The Apollo spacecraft at the Moon





VOCABULARY

goals
suspend
meteor
asteroid
treacherous

galaxy
establish
demonstrate
resolve
retreat

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 might you *demonstrate* that you're a citizen of the universe?
2. Do you think it is important to know about our *galaxy*? Why or why not?

Word Meanings

For each highlighted word on pages 2–3, the meaning is given below. For practice with other meanings, see pages 7–9. For synonyms and antonyms, see page 32.

1. **goals**
(gohlz)
(n.) Your *goals* are the ends toward which you direct your efforts—the things you want to achieve.
(n.) *Goals* are areas or objects that balls or pucks must pass through in order for players to score points in a game.
2. **suspend**
(suh-SPEND)
(v.) When you *suspend* activities, you stop them temporarily.
(v.) If you forbid someone from taking part in an activity or privilege, you *suspend* him or her, such as when you *suspend* a student from school.
3. **meteor**
(MEE-tee-ur)
(n.) A *meteor* is rock or metal in space that forms a streak of light when it enters Earth’s atmosphere.
4. **asteroid**
(ASS-tuh-roid)
(n.) An *asteroid* is a rocky or metallic planetary body that circles the Sun. Too small to be a planet, an *asteroid* is usually less than 3/5 of a mile wide but can measure many miles across.
5. **treacherous**
(TRE-chu-ruhss)
(adj.) A situation that is *treacherous* is filled with potential dangers and hazards.
6. **galaxy**
(GA-luhk-see)
(n.) A *galaxy* is one of countless very large groups of stars and planets found in the universe.
7. **establish**
(ess-TAB-lish)
(v.) A person can *establish* an idea, concept, or theory by proving it.
8. **demonstrate**
(DE-muhn-strayt)
(v.) When you *demonstrate* something, such as your knowledge or ability, you show it clearly.
9. **resolve**
(ri-ZOLV)
(v.) People who *resolve* to do something make a firm decision to do it and to be successful in their effort.
(v.) When you *resolve* a problem or a dispute, you deal with it successfully to clear things up and find an answer.
10. **retreat**
(ri-TREET)
(v.) To *retreat* means to back off from your position or to withdraw from a challenge or a difficult situation.
(n.) A *retreat* is a place you go for privacy, safety, or quiet.



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.

Personal Goals

Treacherous Situations

Objects or Events That Might Make You *Retreat*

Things You Might *Resolve* to Do

Activities or Events That Might Be *Suspended* Due to Bad Weather

Objects That Look or Move Like *Meteors*

Planets in Our *Galaxy*

Things You Can *Demonstrate*

Ways to *Establish* That You Are Correct

Objects That Move Through the Sky Like *Asteroids*

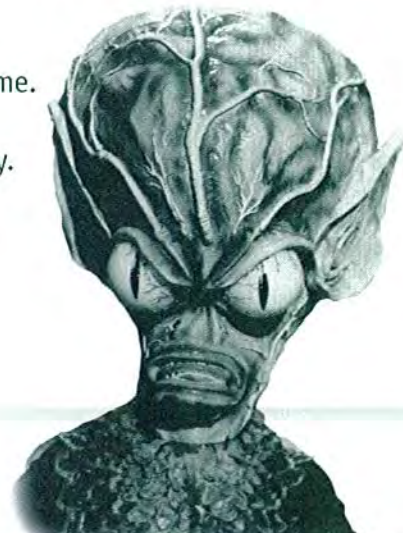
Check for Understanding

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



asteroid	galaxy	retreat
demonstrate	goals	suspend
establish	meteor	treacherous
	resolve	

1. A sudden change in the weather can make hiking up a hill _____.
2. When I saw the mean-looking dog ahead on the sidewalk, I decided to _____ to my yard.
3. Earth is one of the planets in the _____ called the Milky Way.
4. "Shooting star" is another name for a/an _____ because of the streak of light it creates as it approaches Earth.
5. Many scientists now think that dinosaurs became extinct when a large _____ collided with Earth.
6. You should set attainable _____ for yourself so you won't be discouraged.
7. The school will _____ play rehearsal if it continues to snow.
8. Students must _____ their ability before they use the equipment.
9. We _____ to do our best to win the tournament, so we practice daily.
10. Caitlyn wants to _____ her reputation as a serious student, so she turns in all her assignments on time.
11. Driving can be _____ if the roads are slippery.
12. Science fiction often involves strange characters from a distant _____.



Expand Word Meanings

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

My friend Zack loves science fiction. He has fixed up his bedroom—his special **retreat**—to look like the captain's quarters on a spaceship. He writes his own sci-fi stories. In one of them, Earthlings and beings from another galaxy **resolve** disputes by playing a game. The game they invent is space football and it's played on the surface of the moon. Both teams hover in their spaceships over the playing field in one of the moon's craters, and they maneuver robotics to aim the ball toward each other's **goals**. The leaders of each team **suspend** any players who don't follow the game's rules.

Notice that four of the lesson words are used in a different way here. For example, find the word *retreat*. Here *retreat* is a noun that means a place where you go to be alone and undisturbed. Look at the other highlighted words. Can you figure out what they mean here? Refer to page 4 to confirm their meanings.

Apply Other Meanings

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

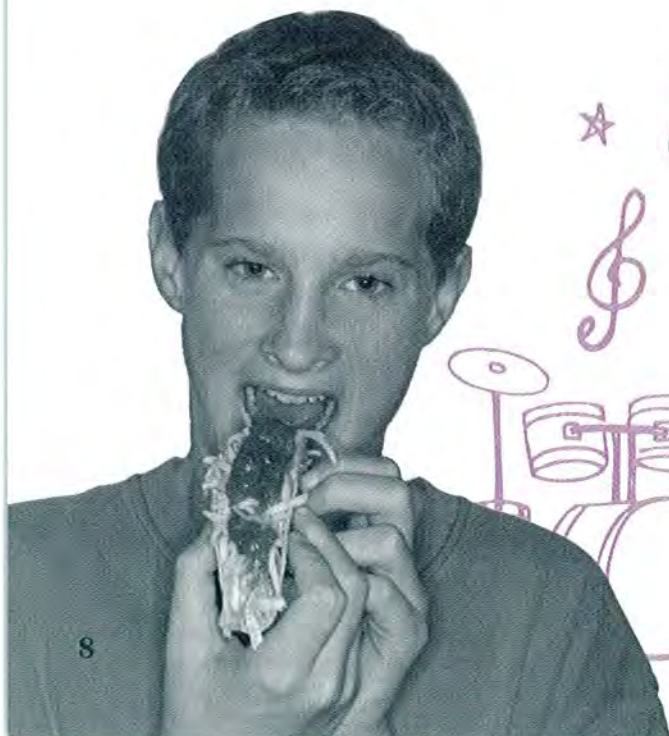
1. The celebrity hid out at a secret _____ in order to escape the reporters and photographers.
2. The washing machine repair technician made several attempts to _____ the problem before she found something that worked.
3. The _____ used in soccer are similar to those used in hockey.
4. The tiny shade garden in the backyard is everyone's favorite _____ on hot days.
5. It's important to learn to _____ your differences without arguing.
6. The university had to _____ the basketball team's coach when he videotaped another team's strategy sessions.
7. In most sports with a court or field, the _____ are positioned at opposite ends.
8. When our dog needs a _____, he avoids the activity in our family room and lies down in his crate.
9. Sometimes it takes great determination to _____ a difficult problem.
10. The company decided to _____ an employee whom they suspected of stealing until they could determine if the accusation was true.

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 situation would be most *treacherous*?
 - walking in the rain
 - running a marathon
 - driving in a storm
- Which of these does an *asteroid* resemble?
 - rocks and dirt
 - clouds and sunlight
 - rockets and planets
- When would be the best time of day to see a *meteor*?
 - nighttime
 - sunrise
 - afternoon
- What might make you *retreat* from an argument?
 - taking a strong position
 - realizing that you are wrong
 - emphasizing your point
- Who would have the authority to *suspend* a baseball player?
 - another player
 - the fans
 - the coach
- Which of these things might someone *resolve* to do?
 - fail a test
 - read a book every week
 - fight with a friend
- Which of these things would *establish* someone's knowledge of Spanish?
 - translating a letter
 - ordering Mexican food
 - listening to Spanish music
- Which of these is NOT true about every *galaxy*?
 - They all have stars.
 - They all have the same shape.
 - They all have planets.
- How would you *demonstrate* your math skills?
 - by signing up for a math class
 - by taking notes
 - by adding fractions together
- What is the most challenging aspect of having *goals*?
 - reaching them
 - forgetting them
 - sharing them with friends



Check Again

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

1. If you set reasonable *goals*, _____
2. Crossing the street can be *treacherous* when _____

3. When a *meteor* streaks through the sky, it _____
4. These footprints in the mud *establish* that _____
5. A school might *suspend* registration for a class if _____
6. I decided to *retreat* from the conversation when _____

7. The idea of an *asteroid* colliding with Earth is frightening because _____

8. People can *demonstrate* their concern for the environment by _____

9. When I think about our *galaxy*, I picture _____
10. A person who frequently arrives late to school might *resolve* to _____

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 using the word *meteor*.
2. Write a sentence using the word *demonstrate* in the third position.
3. Write a ten-word sentence using the word *asteroid* in the sixth position.

Word-Solving Strategies: Context Clues

Punctuation

Punctuation can signal a clue to the meaning of an unknown word. Reread this sentence from “Why Explore Space?”

We all should know that a meteor and a shooting star are the same thing—a small rock that falls from space and burns as it enters our atmosphere.

The dash signals that a definition for **meteor** and *shooting star* will follow. Commas, quotation marks, italics, and parentheses also can be used as signals.

Sometimes, commas, parentheses, and dashes indicate additional information:

An asteroid, unlike a meteor, rarely encounters Earth.

Here, the words set off by commas compare an asteroid and a meteor, but they do not tell you what an asteroid is.

BE CAREFUL!

Practice

A. Write a highlighted word and the punctuation that helps define it in the first two boxes. Then write the meaning of the word in the third box.

For a very short time—only 76 years—Pluto was a planet. Pluto has an **eccentric** (not circular) orbit. Sometimes, it is **proximate**, or close, to the Sun, and sometimes, it's far away. Pluto wasn't discovered until 1930, and because it's quite small, many questioned its status as a major planet. In 2006, experts redefined what makes a planet a planet, and poor Pluto was **demoted**—**relegated** to the new category of “dwarf planet.”

WORD

PUNCTUATION

WORD MEANING

B. Write four sentences using each of the highlighted words from the paragraph above. Use punctuation that signals a definition of the word.

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 heavy snowfall forced the city to *suspend* regular bus service.

Suspend means:

- A reroute
- B discontinue
- C interrupt
- D increase

2. You *establish* yourself as an authority on a topic when you:

- A pretend to know about it
- B learn a few important terms
- C talk about it a lot
- D show you know it well

3. The opposite of *retreat* is:

- A quietly argue
- B go slowly
- C move forward
- D stop pretending

4. *Goals* are things to:

- A work toward
- B keep nearby
- C plan with
- D avoid

5. Which could a person *resolve*?

- A an answer
- B a movie
- C an argument
- D school

6. Read this sentence.

Sometimes you can see the Andromeda *Galaxy* without a telescope.

Galaxy means:

- A outer space
- B planet
- C solar system
- D group of stars

7. A *meteor* is visible because it:

- A reflects moonlight
- B creates a trail of light
- C comes from the Sun
- D breaks off from a star

8. The path would be *treacherous* if it were:

- A covered with ice
- B through a meadow
- C paved with stones
- D bordered with hedges

9. An *asteroid* resembles a:

- A star
- B cloud
- C rock
- D sponge

10. You can *demonstrate* good manners by:

- A talking too loud
- B saying "please" and "thank you"
- C cutting in line
- D asking friends for advice



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Listen to this passage at vocabularyforsuccess.com.

The Life Cycle of a Star

<textbook entry>



What is a life cycle? Every human being goes through one: birth, then life involving growth and change, and finally death. These stages also comprise the life cycle of stars. In fact, as strange as it may seem, it's a bond we share.

Unlike humans, however, the life of a star is extremely long. The result is that, clearly, it's not possible for an astronomer to monitor the entire life cycle of any one star. Therefore, scientists base their understanding of a particular star on the information they piece together from viewing many stars at different stages in their life cycles. It is surprising but true that, overall, the bigger the star, the shorter its life span. A massive star "lives" for millions of years, while a smaller one may "live" for billions. The stages that stars go through from their birth to their death also depend upon their size.

Birth of a Star: In space there are huge clouds of dust and gas called nebulae. Sometimes gravity causes some gases to

compress and clump together into a ball. These events coincide with the ball of gas becoming hotter and hotter, which triggers a nuclear reaction. A star is born!

Life of a Star: The continuing combustion in the star creates both heat and light, and as long as there are gases inside, the star will continue to burn brightly. However, over a very long period of time, the gases will begin to burn out, and the star becomes less luminous.

Death of a Star: Eventually, all the gas burns away and the nuclear reaction stops. For the majority of stars—the smaller ones—the core collapses. Their outer layers drift off into space, leaving an even smaller core behind. This small star, called a white dwarf, gradually cools and then fades away into nothing. For a massive star, however, the end is different. It "dies" in an enormous explosion known as a supernova, sending pieces of itself out into space. When these bits compound with the hydrogen in space, new stars are born.

VOCABULARY

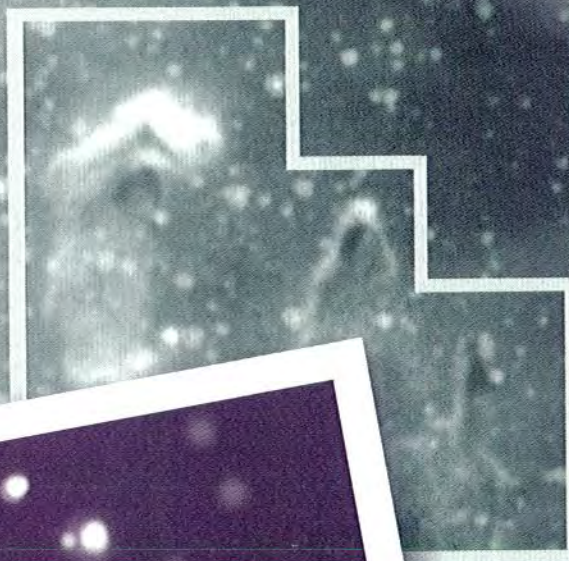
comprise
bond
monitor
overall
compress

coincide
reaction
combustion
luminous
compound

TALK ABOUT IT

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

1. **Overall**, what aspect of the life of a star did you find most interesting or surprising? Why?
2. What are some other *luminous* objects you are familiar with?



Left page: Astronomers gather important information about stars at observatories such as this one.

Background: Stars trail through the sky.

Insets: A look inside space dust and gas shows how stars are born.

Word Meanings

For each highlighted word on pages 12–13, the meaning is given below. For practice with other meanings, see pages 17–19. For synonyms and antonyms, see page 32.

1. **comprise**
(kuhm-PRIZE) (v.) Several smaller parts *comprise* a larger or greater thing.
2. **bond**
(bond) (n.) A *bond* is a strong tie, unifying force, or binding element, such as the feelings that are the basis of friendships.
(v.) When people *bond*, they form a close relationship, often because they see each other or interact frequently.
3. **monitor**
(MO-nuh-tur) (v.) When you *monitor* a situation, you watch it over time and keep track of what is happening.
(n.) A *monitor* is a person who watches or keeps track of a situation, such as a *monitor* who observes students who are taking a test.
4. **overall**
(oh-vur-AWL) (adv.) Something that is true *overall* is true when all circumstances or possibilities are taken into account.
5. **compress**
v. (kuhm-PRESS)
n. (KOM-press) (v.) When things *compress*, they press or squeeze together and are reduced in size.
(n.) A *compress* is placed on an injured body part to aid in healing.
6. **coincide**
(koh-in-SIDE) (v.) When two or more events *coincide*, they happen at the same time.
7. **reaction**
(ree-AK-shuhn) (n.) A *reaction* is a change, such as a chemical *reaction*, that involves a chemical transformation.
(n.) A response to an event or situation is a *reaction*.
8. **combustion**
(kuhm-BUSS-chuhn) (n.) When *combustion* occurs, something bursts into flame and burns.
9. **luminous**
(LOO-muh-nuhss) (adj.) Something that is *luminous* is shining or glowing—giving off light or reflecting light.
10. **compound**
v. (kom-POUND)
n. (KOM-pound) (v.) When things *compound*, they combine or come together to form a whole.
(n.) A *compound* is something formed by combining or uniting multiple parts.



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.

bond (n.)
coincide
combustion
compound (v.)
compress (v.)
comprise
luminous
monitor (v.)
overall
reaction



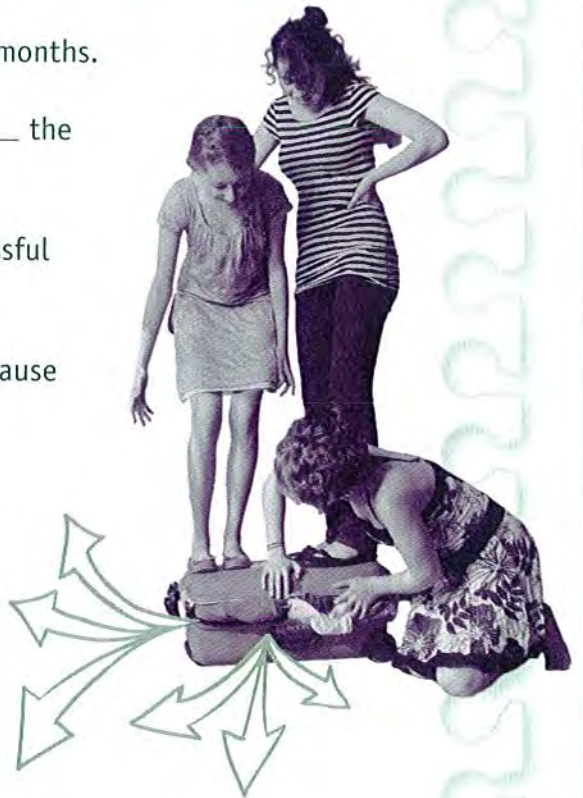
luminous

Check for Understanding

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

bond	compound	monitor
coincide	compress	overall
combustion	comprise	reaction
	luminous	

- I feel a/an _____ with the kids I've gone to school with since kindergarten.
- The coach will _____ our gymnastics practice to make sure we are using the equipment safely.
- Aunt Stephanie planned her visit to _____ with our spring break.
- We combined vinegar and baking soda and observed the _____.
- June, July, and August _____ the summer months.
- We stood on the suitcase and tried to _____ the contents so that we could close the zipper.
- _____, our team managed to have a successful season, despite a few losses.
- Our science teacher warned us not to mix liquids that cause _____.
- The moon appeared as a bright and _____ circle in the night sky.
- Rain, wind, and bitter cold _____ to make a miserable day.
- We didn't raise as much money as we hoped, but _____ it was a very successful school fair.
- _____ the time so you don't stay too long and miss your bus.



Expand Word Meanings

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

Walter was fascinated by stars, so I was not surprised to see him bond with the other members of the astronomy club. He often talked about how much he wanted a telescope. For now, he could only stare out the window and serve as a monitor of the night sky. Once he saw a star streak by. When he leapt up to get a better look, he hit his head on the window. His initial reaction was to cry out in pain, but then poor Walter had to hold a cold compress to his head. It was soaked in a compound of comfrey root and water. The next day, Walter's astronomy club friends agreed that it was worth the pain to see such a sight.

! In this passage, some of the lesson words are used in a different way. Look at *bond*. Here it's a verb that means "form a close relationship." Look at the other highlighted words. Can you figure out what they mean in this context? Refer to page 14 to confirm that the meanings you come up with are correct.

Apply Other Meanings

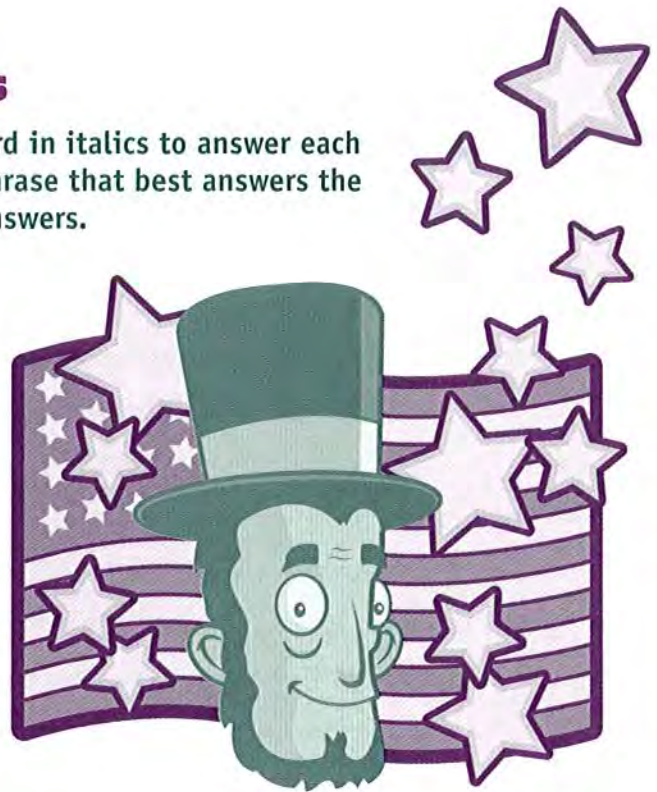
Complete each sentence with a highlighted word from the paragraph above.

1. Mai couldn't wait to see her mother's _____ when she told her she'd won first place in the race.
2. The United Nations often chooses a person to act as an election _____ in countries where, in the past, the government has been dishonest about voting.
3. A _____ of warm olive oil and Vitamin E is a good home remedy for a cat's ear mites.
4. A cool _____ can help when you have a headache or are just feeling tired.
5. Clay tiles are made from a _____ of clay, sand, topsoil, and water.
6. Your stunned _____ tells me that you are surprised to hear that you didn't get the lead in the school musical.
7. Many hours of working together gave the team members a chance to _____.
8. When a child fell off the swings, the playground _____ rushed over to make sure she was not hurt.
9. Should you use a hot or cold _____ to keep a sprained ankle from swelling?
10. When you adopt a kitten, you need to spend time with your new pet so it will _____ with you.

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 kind of remark would most likely get a negative *reaction*?
 - compliment
 - insult
 - praise
- What sort of *overall* impression might you have of a movie you wouldn't see again?
 - mostly liked
 - no opinion
 - mostly disliked
- Which of these people does NOT serve as a *monitor*?
 - writer
 - security guard
 - referee
- You might use a *compress* to relieve which problem?
 - a chipped cup
 - a swollen lip
 - a leaking pipe
- Which two people might feel the strongest *bond*?
 - two people who just met
 - a customer and cashier
 - twin brothers
- In which grouping do all the elements *comprise* a car?
 - driving, bumper, door
 - seats, passengers, hood
 - headlights, steering wheel, horn



- Which holiday might *coincide* with summer break?
 - Fourth of July
 - Presidents Day
 - Thanksgiving
- Which kitchen tool requires *combustion*?
 - kitchen sink
 - stove
 - dishwasher
- Which is least likely to be described as *luminous*?
 - the moon
 - an oven
 - a flashlight
- Which might *compound* to make a miserable day?
 - rain and stinging wind
 - sunshine and gentle breezes
 - snowflakes and bright sun

Check Again

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

1. People form a *bond* when they _____
2. If you *compress* a balloon, it _____
3. *Combustion* occurs when _____
4. Parents *monitor* their children's activities because _____

5. I love it when school holidays *coincide* with _____
6. We didn't win the championship, but *overall* _____

7. The activities that *comprise* a typical weekday for me are _____

8. When there is a *reaction* between wood and a spark, _____
9. They thought the *luminous* object in the sky was a UFO, but it turned out to be _____

10. You will *compound* the problem of having a cold if you _____

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.

1. Write a sentence using the word *coincide*.
2. Write a sentence using *compress* in the third position.
3. Write an eight-word sentence using *bond* in the third position.

Write
Your Own

Word-Solving Strategies: Prefixes

The prefixes **co-**, **com-**: “together,” “with”

A prefix is added to the beginning of a word. The meaning of a word’s prefix can often help you figure out the meaning of the word.

The prefix *co-* has the meaning “together.” You can see how the meaning of the prefix works in words like *coauthor* and *co-worker*: Coauthors write something together; co-workers work together. Although the lesson word *coincide* is not formed by adding *co-* to a familiar English word, the meaning “together” is clear in the word. Events that *coincide* occur together.

The prefix *com-* has a similar meaning. *Com-* means “together” or “with.” Four lesson words have the prefix *com-*: *compound*, *compress*, *comprise*, and *combustion*. Think about how the meaning “together” or “with” is part of the meaning of each of these words. When circumstances *compound*,

they come together. When objects *compress*, they squeeze together. When parts *comprise* something, they group together to create it. In *combustion*, heat or a spark comes together with a substance to create fire.

Examples

Look at these examples of words with *co-* or *com-*. Think about how “together” or “with” is part of each word’s meaning.

co- + host → cohost

co- + exist → coexist

co- + operate → cooperate

com- + pose → compose

com- + pile → compile

com- + plete → complete

com- + rade → comrade

Not all words that begin with *co-* or *com-* contain the prefixes *co-* or *com-*. Knowing the meaning of the prefixes will not help you figure out the meanings of these words. For example, the word *come* means “to move toward a place,” and *comic* means “having to do with laughter.”

BE CAREFUL!

Practice

Use what you’ve learned about the prefixes *co-* and *com-* to write a definition for each of these words. Include “with” or “together” in each definition. You may use a dictionary if you wish.

1. cowrite _____
2. collect _____
3. communicate _____
4. compatible _____
5. combine _____

6. combine _____
7. coeducation _____
8. collaborate _____
9. compare _____
10. co-captains _____

Practice for Tests

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

1. Read this sentence.

He tried to *compress* all his research into a three-page essay.

Compress means:

- A state
- B explain
- C squeeze
- D summarize

2. A synonym for *compound* is:

- A create
- B compose
- C contract
- D combine

3. Two activities *coincide* if they happen:

- A at the same time
- B in sequence
- C without any problems
- D without notice

4. A word closely associated with *reaction* is:

- A remain
- B change
- C connect
- D repetition

5. *Combustion* does NOT produce:

- A heat
- B light
- C oxygen
- D ashes

6. Read this sentence.

Our team did well *overall*, since we lost only two of the twelve games.

Overall means:

- A luckily
- B because of
- C against all odds
- D in almost all ways

7. When you *monitor* a process, you:

- A cause a change
- B watch and note what happens
- C listen to advice and comments
- D watch an expert on TV

8. A synonym for *comprise* is:

- A make up
- B confuse
- C settle for
- D squeeze

9. Something that is *luminous* would be:

- A difficult to see
- B hidden in shadow
- C visible in the dark
- D invisible

10. There is often a *bond* between people who:

- A are forced to be together
- B share the same interests
- C dislike each other
- D have few advantages

Is There Life on Mars?

<informational article>

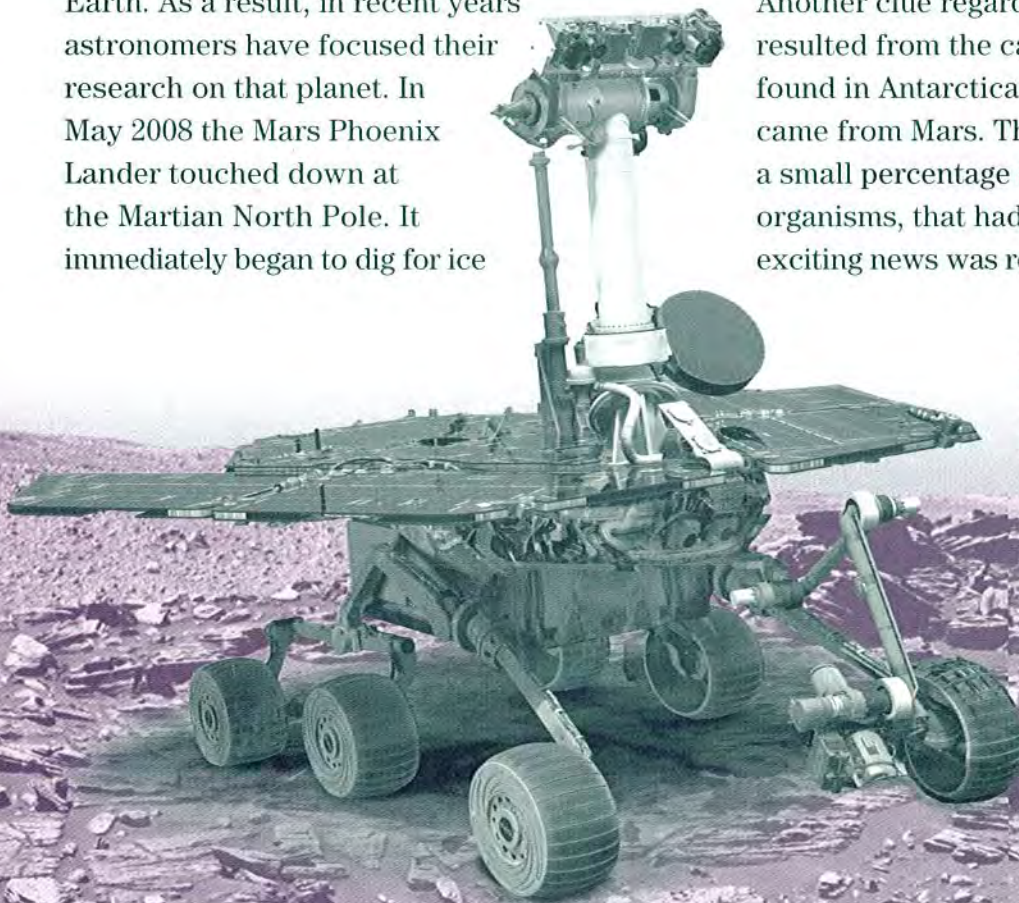
For centuries, human beings have asked themselves if there might be life on other planets. Before, we could only wonder. Now, with each satellite or probe sent into space, we've hoped to find the answer. That's because the possibility that life exists on one of Earth's celestial neighbors is too intriguing to ignore.

Among the planets that orbit, or circle around, the Sun, Mars is the most like Earth. As a result, in recent years astronomers have focused their research on that planet. In May 2008 the Mars Phoenix Lander touched down at the Martian North Pole. It immediately began to dig for ice

using a special mechanical arm controlled by NASA scientists back on Earth. This mission taught scientists that underneath the reddish, sandy surface of the planet, there was evidence of frozen water on Mars. This was an important find because water is one of the most essential resources for supporting life. If there were no water on Mars, we would know that there is no life there, either. This gave scientists hope.

Another clue regarding the possibility of life resulted from the careful study of a meteorite found in Antarctica. Scientists knew that it came from Mars. Their study of it revealed a small percentage of bacteria, single-celled organisms, that had once been alive. This exciting news was reported around the world.

Rovers similar to this one gather information from Mars' surface to help us understand if the planet can support life.



VOCABULARY

satellite	immense
celestial	investment
orbit	constrained
resources	administration
percentage	privilege

Now scientists had proof that life had once existed on Mars! It has taken a long time and an immense investment of money by the U.S. government for NASA scientists to learn what we now know about the “red planet.” However, we still don’t have all of the answers. That’s why research continues. Like any government agency, NASA is sometimes constrained by funding cuts, but the careful administration of its budget should ensure that money will continue to support future missions to Mars.

NASA hopes that rock and soil samples obtained from the planet during these missions will bring more discoveries. Imagine what a privilege it would be for scientists if they found proof that life still exists on Mars!

TALK ABOUT IT

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

1. Why would it be a *privilege* to discover that life exists on another planet?
2. Why do you think NASA continues to make an *investment* in the study of life on Mars?



Word Meanings

For each highlighted word on pages 22–23, the meaning is given below. For practice with other meanings, see pages 27–29. For synonyms and antonyms, see page 32.



1. **satellite**
(SA-tuh-lite)
(n.) A *satellite* is a natural or manufactured object that moves in a circle around Earth or another planet. The Moon is Earth's natural satellite.
(n.) Something that is dependent on another thing is a *satellite*. A small country that is controlled by a larger country is a *satellite*.
2. **celestial**
(suh-LESS-chuhl)
(adj.) Something that is *celestial* has to do with the heavens or what is visible in the sky from Earth.
3. **orbit**
(OR-bit)
(v.) When one object travels in a circle around another object, it is said to *orbit* that other object.
(n.) The *orbit* of one object around another is the path the object takes.
4. **resources**
(REE-sorss-iz)
(n.) *Resources* provide the support that enhances the quality of life or makes life or some undertaking possible, such as water or the Internet.
5. **percentage**
(pur-SEN-tij)
(n.) A *percentage* is a part or fraction of a whole. The *percentage* of the day a student spends at school is a little more than one-fourth.
6. **immense**
(i-MENSS)
(adj.) Something that is *immense* is huge in size or degree.
7. **investment**
(in-VEST-ment)
(n.) An *investment* is money or time devoted to something with the expectation that you will get some benefit, such as more money, back.
8. **constrained**
(kuhn-STRAYND)
(v.) Something that is *constrained* is confined or limited. A dog might be *constrained* by a fence, or an artist by a lack of art supplies.
9. **administration**
(ad-mi-nuh-STRAY-shuhn)
(n.) *Administration* is the process through which an activity is managed or supervised.
(n.) The term of office of a president, mayor, or other elected official is an *administration*. The people who participate in that term are the *administration*.
10. **privilege**
(PRIV-uh-lij)
(n.) If you have a *privilege*, you enjoy a special right or a particular advantage.
(v.) When you *privilege* someone, you grant that person a special advantage, status, or position.

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.

Natural Resources

Privileges You Obtain As You Get Older

Objects That Orbit around Other Things

Celestial Objects

Animals That Are Immense

Ways People Are Constrained

Activities That Involve Administration

Purposes of Satellites

Types of Investments

Other Ways to Refer to a Percentage

Check for Understanding

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

administration	immense	privilege
celestial	investment	resources
constrained	orbit	satellite
	percentage	

1. The scientists sent the _____ into space to take pictures of Earth.
2. There are sixty small moons that _____ the planet Jupiter.
3. Thousands of tiny _____ objects twinkled in the night sky.
4. We had the _____ of previewing the new show at the planetarium before everyone else could see it.
5. A large _____ of the graduates from our high school go to college.
6. Carlos wasn't sure which _____ would earn him the most money.
7. _____ such as clean air are critical to human life and must be protected.
8. We were awestruck by the _____ expanse of sky visible from the top of the mountain.
9. Their plans to go to a movie were _____ by a lack of funds.
10. Quinn was in charge of the _____ of the fundraiser because of her experience managing large events.
11. Our band considered it a/an _____ to be invited to march in the parade.
12. _____ effort can bring equally great rewards.



Expand Word Meanings

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

The Glenn Research Center in Ohio is a **satellite** of NASA. There, scientists conduct research in technology and aeronautics to advance space exploration. The Franklin D. Roosevelt **administration** created the center under another name in 1941. It began as an aircraft engine research laboratory. In 1991 it was renamed to honor John H. Glenn, the first American to follow an **orbit** around the Earth. He returned from space a national hero. Other astronauts have since gone into space, but we **privilege** Glenn with this honor to acknowledge his unique contributions to American history.

! This passage deals with space exploration, but some lesson words, such as *satellite*, have different meanings here. *Satellite* is a facility that is part of a larger organization. Try to figure out the meaning of the other highlighted words. Refer to page 24 to confirm your ideas.

Apply Other Meanings

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

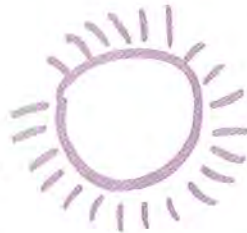
1. The state university is planning to open a small _____ campus in our community.
2. The first space shuttle was launched in April 1981, during President Reagan's _____.
3. The _____ of the Earth around the Sun is nearly a circle.
4. Some people felt that if the entire debate club attended the competition, it would _____ those who hadn't come to meetings or contributed to the team's success.
5. During the current mayor's _____, our city has seen many positive changes.
6. From 1952 to 1990, Poland was a _____ nation of the Soviet Union.
7. The guidelines for the award _____ projects that support early childhood education.
8. We can tell that the Moon moves in its _____ around the Earth because it changes position in the sky throughout the night.
9. The city office was a _____ of the largest medical center in the state.
10. At the beginning of her _____, everyone had high expectations of the new director of education.

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.



- What might make you feel most *constrained*?
 - too many rules
 - lots of freedom
 - a great deal of knowledge
- Which would you consider a *privilege*?
 - having to wash the dishes
 - babysitting a difficult child
 - meeting one of your heroes
- Where might you find a *satellite*?
 - in the air
 - in outer space
 - under the ocean
- Which is NOT a *celestial* object?
 - Earth's moon
 - a small planet
 - a tall tree
- If you spend a *percentage* of your time doing something, how much time are you doing it?
 - all of the time
 - some of the time
 - none of the time
- Which is considered the wisest *investment* in your future?
 - a start-up business
 - a lottery ticket
 - a college education
- Which of the following is part of an American president's *administration*?
 - the U.S. government
 - the voters
 - the vice president
- In which pattern does an object travel in order to have an *orbit*?
 - a diamond pattern
 - a circular pattern
 - a varying pattern
- Which *resources* would be most useful in solving a mystery?
 - wealth and power
 - reason and observation
 - skill and balance
- Which structure would you describe as *immense*?
 - a sports stadium
 - an expensive car
 - a friendly cafe



Check Again

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

1. A weather *satellite* circles Earth and gathers _____

2. I considered it a *privilege* to be able to _____
3. It took all of our *resources* to _____
4. A great *percentage* of the members of that community _____

5. There is an *immense* difference between _____

6. When people make a financial *investment*, they expect _____
7. Objects that *orbit* in space _____
8. When the current *administration* runs for reelection next year, the governor will benefit from the fact that _____
9. The law requires that dogs be *constrained* by _____
10. *Celestial* objects appear in the night sky as _____

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 using the word *immense*.
2. Write a sentence in which the final word is *resources*.
3. Write an eight-word sentence using the word *orbit* in the sixth position.

Word-Solving Strategies: Context Clues

Embedded Definitions

Sometimes an author helps the reader out with a difficult word by providing a definition that is embedded in the text. Read this sentence from “Is There Life on Mars?”

Among the planets that orbit, or circle around, the Sun, Mars is the most like Earth.

The word **orbit** is followed by a phrase that defines the word directly in the text: *circle around*. Embedded definitions are sometimes, but not always, set off by commas.

Although the word *or* can signal a synonym or a definition, it doesn't always. Read this sentence:

For decades people have been fascinated, or even terrified, by the idea of life on Mars.

In this case, *or* introduces a contrast, not a synonym, for *fascinated*.

BE CAREFUL!

Practice

A. Write a highlighted word and its embedded definition in the first two boxes. Then write the meaning of the word in the third box.

The idea of life on Mars has fascinated people for a long time. In 1950, Ray Bradbury wrote a series of vignettes, or short stories, called “The Martian Chronicles.” The stories tell about humans who escape an Earth that has been devastated—completely ruined by atomic warfare. The humans attempt to colonize Mars. They deal with the hostile Martian climate and with unfriendly aboriginal Martians, who were the first beings to live there.

WORD

EMBEDDED DEFINITION

WORD MEANING

B. Write a sentence for each of the highlighted words from the paragraph above. You will use one word twice. Use embedded definitions.

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 seatbelts kept the students *constrained* on the school bus.
Constrained means:
 A separated
 B under control
 C restricted
 D in pairs
2. Objects *orbit* a planet when they:
 A hit it
 B fall to Earth
 C leave the atmosphere
 D circle it
3. Which office is NOT a *satellite* of a company or organization?
 A local branch office
 B state information center
 C national headquarters
 D regional mail center
4. A word associated with *celestial* is:
 A heavenly
 B earthly
 C aliens
 D astronaut
5. If you make an *investment*, you expect:
 A to waste your time
 B to get fame and fortune
 C to receive some benefit
 D to lose your money
6. Read this sentence.
It was a *privilege* to be invited to speak at the assembly.
Privilege means:
 A serious task
 B difficult experience
 C unwanted assignment
 D special honor
7. The *administration* of a hospital might:
 A perform physical exams
 B hire hospital employees
 C drive an ambulance
 D serve patients food
8. The opposite of *immense* is:
 A miniature
 B enormous
 C average
 D tremendous
9. A word related in meaning to *percentage* is:
 A average
 B whole
 C fraction
 D dimension
10. *Resources* enable a person to:
 A trick others
 B predict the future
 C quote from memory
 D accomplish things

Synonyms and Antonyms

In the following Word Bank, you will find synonyms and antonyms for some of the words in Lessons 1–3. (Remember: Some words have both synonyms *and* antonyms.) Study these words; then complete the exercises below.

harmless	earthly	advance	continue	valid	dangerous
expand	glowing	order	overlap	benefit	enormous

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

- The mountain road is **treacherous** in the wintertime when drifting snow creates _____ driving conditions.
- A **luminous** moon lit our way as we walked home this evening, but last night, heavy clouds masked the moon's _____ surface.
- As members of Mr. Lee's class, we have the _____ of learning music from a gifted singer. It is a **privilege** that we all enjoy.
- My spring vacation will **coincide** with my cousin's time off from school. Because the dates _____, we'll be able to make a beach trip together.
- Many _____ barges travel along the waterway, carrying goods such as coal and cement in their **immense** hulls.

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

- Coach will **suspend** basketball practice for the week. Practice will _____ next week after the floors in the gym have been refinished.
- An air mattress will **compress** when you lie on it, but it will _____ again when you get up.
- Many wild animals that look _____ in a zoo cage can be **treacherous** in their natural habitat.
- Looking up at **celestial** bodies from our _____ point of view can make a person feel very small.
- As our soldiers began to _____ into enemy territory, the enemy troops hurried to **retreat**.

Word Study: Denotation and Connotation

Every word has a **denotation**, the literal meaning that you find in a dictionary. Many words also have a **connotation**, the feelings and images associated with the word. Connotations are usually described as being positive or negative. A neutral word has no connotations.

POSITIVE	NEGATIVE	NEUTRAL
friend	rival	classmate
peaceful	boring	quiet
spontaneous	chaotic	unplanned

Look at the word *luminous* in Lesson 2 and some of its synonyms:

bright	illuminated	blinding
glowing	lit	

Most of these words are neutral. They have neither positive nor negative connotations. The word *blinding*, however, has a negative connotation. It suggests that a light is so bright that it can cause some actual harm or discomfort.

Practice

A. Underline the word in parentheses that has the connotation (positive, negative, or neutral) given at the beginning of the sentence.

- negative** 1. They realized that they had made a/an (**immense, monstrous**) mistake.
- positive** 2. The light made her complexion look (**luminous, shiny**).
- neutral** 3. The lifeguard's job was to (**monitor, spy on**) activity in or near the water.
- neutral** 4. Instead of getting into an argument, Constantine chose to (**flee, retreat**).
- negative** 5. Driving in the dark on icy roads can be (**treacherous, risky**).
- positive** 6. He was granted the (**favor, privilege**) of marching with the honor guard.
- negative** 7. She was very (**flexible, fickle**) in her tastes and opinions.

B. Work with a partner. Write a plus sign (+) if the word has positive connotations; write a minus sign (-) if the word has a negative connotation. Put a zero (0) if the word is neutral.

- | | | | |
|-------------------------------------|--------------------------------------|-------------------------------------|---------------------------------------|
| 1. resolve <input type="checkbox"/> | 3. annoy <input type="checkbox"/> | 5. enrich <input type="checkbox"/> | 7. establish <input type="checkbox"/> |
| 2. deceit <input type="checkbox"/> | 4. comprise <input type="checkbox"/> | 6. suspend <input type="checkbox"/> | 8. goals <input type="checkbox"/> |

Vocabulary for Comprehension

Read the following passage, in which some of the words you have studied in Lessons 1–3 appear in boldface type. Then answer questions 1–6.



Space on Earth

Max Adler was an early stockholder in the store Sears and Roebuck. In 1928, he heard about a device that displayed images of **celestial** objects on the inner surface of a dome. He
5 visited the Carl Zeiss Company in Germany to see them **demonstrate** this device. The illusion of the night sky impressed him and made him **resolve** to donate part of his fortune to **establish** a planetarium in Chicago. He
10 believed that the popular ideas about the universe were inaccurate. He wanted to give the people of his city the **privilege** of seeing how **immense** and ordered the universe was. He wanted them to see that just as people are
15 related, everything in the sky is, too.

Adler's **investment** created the first modern planetarium in the Western Hemisphere—a room where people could view a model of the solar system. It opened in 1930 and was a
20 success from the beginning. People came in great numbers to gaze at the movement of the **luminous** orbs that make up the **galaxy**.

For eighty years, the Adler Planetarium has been a Chicago landmark. Today, the Sky
25 Pavilion, the Doane Observatory, and the Sundial Plaza have joined the original twelve-sided domed building to **comprise** the institution that we know today.

1. You **demonstrate** (line 6) something by

- A figuring out how it works
- B explaining how it works
- C asking questions about it
- D showing how it works

2. When you **resolve** (line 8) to do something, you are

- A halfhearted
- B determined
- C uninterested
- D curious

3. A **privilege** (line 12) is something

- A everyone has
- B no one wants
- C some people have
- D that is not enjoyable

4. Another word for **immense** (line 13) is

- A patterned
- B regular
- C great
- D brilliant

5. Something that is **luminous** (line 22) is

- A glowing
- B flashing
- C distant
- D uneven

6. In line 27, **comprise** means

- A support
- B make up
- C exceed
- D surround