memory

maximizing recall for test success
In this chapter...

you explore answers to the following questions:

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- **HOW** can you improve your memory?  p. 165
- **HOW** can mnemonics boost recall?  p. 173
- **WHY** do you need a good memory when you have the Internet?  p. 180

Tammy is studying hard—in six-hour stretches if she can keep her eyes open—for mid-terms coming at the end of the month. She reads her textbook and class notes over and over again and, to be sure the material is fresh in her mind, she studies until four in the morning before each test. When she gets back her grades, she is shocked: a C+ in two courses, a C in a third, and a C– in a fourth. “How could this have happened?” she groans to a friend. “I studied so hard. I really thought this stuff was in my brain.”
Habit for Success

put your senses to work

Note—and then look beyond—what you see and hear. Open your sensory pathways up to all kinds of information. Using all five senses as you learn can help you lock information into long-term memory in a meaningful way.

- Real People Put Their Senses to Work p. 166
- Powerful Questions about Putting Your Senses to Work p. 180
- Habit Summary p. 181
- Test Prep: Start It Now p. 185

How Does Memory Work?

Memory forms the foundation for both learning and test success. Doing well on exams requires that you understand and memorize key information. Memorization puts concepts, facts, processes, formulas, and so on at your fingertips so you can answer knowledge-based questions.

Memorization also gives you the tools to tackle higher level thinking questions. Moving from lower thinking levels (knowledge and understanding) to higher ones (application, analysis, synthesis, and evaluation) requires that you have good recall of information. You will study this concept, known as Bloom’s Taxonomy, in Chapter 7.

To avoid Tammy’s struggle, you need to retain what you learn. This chapter provides a host of memory-improvement techniques that you can make your own with a positive attitude and active involvement. Your first step is to explore how memory works.

The Information Processing Model of Memory

Memory refers to the way the brain stores and recalls information or experiences that are acquired through the five senses. While you take in thousands of pieces of information every second—everything from the shape and color of your chair to how your history text describes Abraham Lincoln’s presidency—you remember few. Unconsciously, your brain sorts through stimuli and stores only what it considers important.
The more mental gymnastics you do, the more agile and the quicker your brain becomes.

Nathan Tublitz, University of Oregon neurobiologist

Look at Key 6.1 as you read how the brain forms lasting memories:

1. Raw information, gathered through the five senses, reaches the brain.
2. This information enters sensory registers, where it stays for only seconds.
3. You then choose to pay attention to some information in the sensory register. When you selectively look, listen, smell, taste, or feel the information, you move it into short-term memory, also known as working memory, which contains what you are thinking at any moment and makes information available for further processing. Short-term memory lasts no more than about 30 seconds and has limited storage.
4. Through *rote rehearsal*—the process of repeating information to yourself or even out loud—you keep information in short-term memory. (You use rote rehearsal when dialing a phone number you just learned.) This is only temporary learning unless you move the information into long-term memory.

5. You keep information in **long-term memory** through diligent, active rehearsal over time. Long-term memory is the storage house for everything you know from Civil War battle dates to the lyrics of a favorite song. There are no limits to how much information long-term memory can hold or how long it can hold it. Long-term memory has three separate storage houses:

- **Storage of procedural memory.** This area stores information about *procedures*, or, in other words, how to do things—ride a bike, drive a car, blow into the mouthpiece of a trombone. It takes awhile to develop these memories, but they are difficult to lose.

- **Storage of declarative memory.** Memories of facts, concepts, formulas, etc. are stored here. These are relatively easy to learn but are easy to forget without continual review.

- **Storage of episodic memory.** Memories of events linked to personal experiences are stored here.

6. When you need a piece of information from long-term memory, the brain retrieves it and places it in short-term memory. On test day, this enables you to choose the right answer on a multiple-choice question or lay out a reasoned, fact-based argument for an essay question.

The movement of information into the sensory register, then into short-term and long-term memory, then back again into short-term memory strengthens the connections among brain cells, called *neurons*. Memories are built at the *synapses*—the junctions through which brain cells communicate. When you learn an algebra formula, for example, your brain forms new connections. Every time you review the formula, the connections get stronger.

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**Why You Forget**

Problems like head injuries and poor nutrition can cause memory problems, but the most common reason that information fails to stay in long-term memory is ineffective studying—not doing what is needed to retain what you learn. As Key 6.2 shows, retaining information over time requires continual review. You are still learning information 10 minutes after you hear it the first time. If you review the material over time—after 24 hours, after a week, a month, six months, and more—you will hold onto the knowledge. If you do not review, the neural connections will weaken, and eventually you will forget.

In a classic study conducted in 1885, researcher Herman Ebbinghaus memorized a list of meaningless three-letter words such as CEF and LAZ. He then examined how quickly he forgot them. Within one hour, he had forgotten more than 50% of what he had learned; after two days, he knew less than 30% of the memorized words. Although Ebbinghaus's recall of the nonsense syllables remained fairly stable after that, his experiment shows how fragile
memory can be—even when you take the time and expend the energy to memorize information.3

If forgetting is so common, why do some people have better memories than others? Some may have an inborn talent. More often, though, they succeed because they actively and consistently use techniques for improving recall.

How Can You Improve Your Memory?

As you learn new material, your goal is to anchor information in long-term memory. Memory strategies will help you succeed.

Have Purpose, Intention, and Emotional Connection

Why can you remember the lyrics to dozens of popular songs but not the functions of the pancreas? Why can you remember where you were on September 11, 2001, the day the World Trade Center towers were attacked, but not how to record business transactions for your accounting course? Perhaps this is because you have an emotional tie to the lyrics and what happened on 9-11. When you care about something, your brain responds differently, and you learn and remember more easily.
In 1935, when he was 9 years old, Henry Gustav Molaison was run down by a bicycle. He fell and hit his head hard on the pavement. Soon after, he began suffering severe seizures, which worsened over the years.

By the time Henry was 27, he endured as many as 10 seizures a day. Blacking out, convulsing, and unable to work, he was desperate for help and agreed to undergo experimental surgery.

His surgeon inserted a metal tube into his brain and removed two finger-sized pieces of tissue from a portion of the brain called the hippocampus. The operation reduced Henry’s seizures but robbed him of the ability to form current memories. His only lasting memories were of his early life.

Brain researcher David Amaral explained how this changed Henry’s life. When Henry was in his 70s, “I asked him to describe what he looked like. He said without hesitation that he had dark curly hair. He was recalling what he looked like before the surgery. He didn’t have the ability to remember that he had aged. Think about it. Every time Henry looked in the mirror, he saw a stranger.”

Stop and Think
Imagine living without the ability to form memories. Would you be the same person? Would you be able to fulfill your goals and dreams?

From the time of his surgery in 1953 to his death in 2008, Henry was the most studied individual in medical science. “Before Henry, scientists had no idea how memory was organized,” said brain researcher Larry Squire. From their work with Henry, they learned that two separate brain systems controlled memory formation. The first, known as declarative memory and located in the hippocampus, is responsible for the ability to remember names, faces, and new experiences; store them in long-term memory; and retrieve them when needed. The second memory system, located in another brain region, controls procedural memory (how to perform physical actions like walking). This part of Henry’s brain was unaffected.

Stop and Think
Thinking about the separate declarative and procedural memory systems, consider your own ability to form memories. Do you have an easier time with one form of memory than the other?

Remarkably, Henry’s short-term memory was strong—he could hold onto thoughts for about 20 seconds—but without a hippocampus, he couldn’t move them into long-term memory. So each time he met one of his long-time researchers, it was like he was meeting him for the first time.

For many years after his surgery, Henry lived with his parents. He was able to do the ordinary tasks of life—making lunch, watching television, mowing the lawn—by relying on what he remembered from his pre-surgery years. He seemed to sense that he was part of a major breakthrough, although he was not sure what it was. One thing that he never forgot was his own name.

Think about Henry and Think about Yourself
What does Henry’s story tell you about the connection between who you are and what you know and remember? Respond to this statement: Knowing how memories are formed convinces me that my brain has enormous power to gather and remember sensory information and that I can use that power to succeed.

Knowing that he was dying of pancreatic cancer, Professor Randy Pausch gave a “last lecture” about what mattered most to him and about the preciousness of every experience and sensation. His book, titled The Last Lecture, is read on college campuses all over the country, and videos of his lecture are available on YouTube.
To achieve the same results in school, try to create a purpose and will to remember by becoming emotionally involved with what you are studying. For example, an accounting student might think of a friend who is running a small business and needs to keep his records in order—to pay bills on time, to record income, to meet tax payments. Without proper accounting, the business cannot operate. Putting himself in the position of his friend’s accountant, the student connects learning accounting principles with making a difference in a friend’s life.

Understand What You Memorize

Something that has meaning is easier to recall than something that makes little sense. This basic principle applies to everything you study. Figure out logical connections, and use these connections to help you learn. For example, in a plant biology course, memorize plant families; in a history course, memorize events by linking them in a cause-and-effect chain.

When you are having trouble remembering something new, think about how the new idea fits into what you already know. A simple example: If you can’t remember what a word means, look at the word’s root, prefix, or suffix. Knowing that the root *bellum* means “war” and the prefix *ante* means “before” will help you recognize that *antebellum* means “before the war.”

Use Critical Thinking

Critical thinking encourages you to associate new information with what you already know. Imagine you have to remember information about the signing of the Treaty of Versailles, which ended World War I. How can critical thinking help?

- Recall everything that you know about the topic.
- Think about how this event is similar to other events in history.
- Consider what is different and unique about this treaty in comparison with other treaties.
- Explore the causes that led up to this event, and look at the event’s effects.
- Evaluate how successful you think the treaty was.

This critical exploration makes it easier to remember the material you are studying.

Limit and Organize the Items You Are Processing

This involves three activities:

*Separate main points from unimportant details.* Ask yourself, “What is the most important information?” Highlight only the key points in your texts, and write notes in the margins about central ideas (see Key 7.6).
Identify the course that interests you the most this term. Engaging your intrapersonal intelligence, think about the roles that memorization and critical thinking are likely to play in your studying. Then complete the following:

Describe some material you have to memorize:

Describe specific ways in which you will use critical thinking to learn and retain the material:

Evaluate how the material you have to remember will be important to your working and/or personal life after college. Describe the connection:

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**Chunking**

**Chunking** placing disconnected information into smaller units that are easier to remember.

*Divide material into manageable sections*. Generally, when material is short and easy to understand, studying it from start to finish improves recall. With longer material, however, you may benefit from dividing it into logical sections, mastering each section, putting all the sections together, and then testing your memory of all the material. **Chunking** increases the capacity of short-term and long-term memory. For example, while it is hard to remember these 10 digits—4808371557—it is easier to remember them in three chunks—480 837 1557. In general, try to limit groups to 10 items or fewer.
Study plan success depends on a good memory

**Key 6.3**

Day 8 (in eight days, you’ll be taking a test)

*Planning Day*
- List everything that may be on the exam. (Check your syllabus and class notes; talk with your instructor.)
- Divide the material into four learning chunks.
- Decide on a study schedule for the next seven days—when you will study, with whom you will study, the materials you need, etc.

Day 7 (Countdown: seven days to go)

*Study Chunk A*
- Use the techniques described in Chapters 7–9 to study Chunk A.
- Memorize key concepts, facts, formulas, etc. that may be on the test.
- Take an active approach to learning: take practice tests, summarize what you read in your own words, use critical thinking to connect ideas, etc.

Day 6 (Countdown: six days to go)
- *Use the same techniques to study chunk B.*

Day 5 (Countdown: five days to go)
- *Use the same techniques to study chunk C.*

Day 4 (Countdown: four days to go)
- *Use the same techniques to study chunk D.*

Day 3 (Countdown: three days to go)
- Combine and review chunks A and B.

Day 2 (Countdown: two days to go)
- Combine and review chunks C and D.

Day 1 (Countdown: one day to go)
- *Put it all together: Review chunks A, B, C, and D.*
- Take an active approach to review all four chunks.
- Make sure you have committed every concept, fact, formula, process, etc. to memory.
- Take a timed practice test. Write out complete answers so that concepts and words stick in your memory.
- Create a sheet with important information to memorize (again) on test day.

Test Day—Do Your Best Work

- Look at your last-minute study sheet right before you enter the test room so that difficult information sticks.
- As soon as you get your test, write down critical facts on the back of the paper.

The eight-day study plan in Key 6.3 relies on chunking as it links test success to memorization. The plan starts eight days before a big exam and ends on test day.

*Use organizational tools.* Rely on an outline, a think link, or another organizational tool to record material and the logical connections among the elements (see Chapter 9 for more on note taking). These tools expose gaps in your understanding as they help you study and learn.

Memory
Recite, Rehearse, and Write

When you recite material, you repeat key concepts aloud, in your own words, to aid memorization. You also summarize these concepts. Rehearsing is similar to reciting but is done silently. Writing is reciting on paper. All three processes actively involve you in learning and remembering material. Use these steps to get the greatest benefit:

- Focus as you read on main ideas, which are usually found in the topic sentences of paragraphs (see Chapter 7). Then recite, rehearse, or write the ideas down.
- Convert each main idea into a key word, phrase, or visual image—something that is easy to recall and that will set off a chain of memories that will bring you back to the original material. Write each key word or phrase on an index card.
- One by one, look at the key words on your cards and recite, rehearse, or write all the associated information you can recall. Check your recall against the original material.

These steps are part of the process of consolidating and summarizing lecture and text notes as you study (see Chapter 9).

Reciting, rehearsing, and writing involve more than rereading material and then parroting words out loud, in your head, or on paper. Because rereading does not necessarily require involvement, you can reread without learning, which Tammy may have done in her marathon study sessions. However, you cannot help but think and learn when you convert text concepts into key points, rewrite main ideas as key words and phrases, and assess what you know and what you still need to learn.

Study During Short, Frequent Sessions

You can improve your chances of remembering material if you learn it more than once. A pattern of short sessions, say three 20-minute study sessions, followed by brief periods of rest is more effective than continual studying with little or no rest. (Tammy would probably have retained more had she followed this advice.)

Try studying on your own or with a classmate during breaks in your schedule. Although studying between classes isn’t for everyone, you may find that it can help you remember more. If you study in bed—even for short periods—try to sit up straight to avoid dozing.

When you finish studying for an exam the next day, try to go to sleep. Sleep improves memory as it reduces interference from new information. When you can’t go to sleep right away, put off studying other subjects until your exam is over. When studying for several tests at once, avoid studying two similar subjects back to back. Your memory may be more accurate when you study history after biology rather than chemistry after biology.

By the way . . .

shortchanging your sleep during the week impairs your ability to remember and learn, even if you try to make up for it by sleeping all weekend.
Practice the Middle

When you are trying to learn something, you usually study some material first, attack other material in the middle of the session, and approach still other topics at the end. The weak link is likely to be what you study midway. Knowing this, try to give this material special attention.

Use Flash Cards

Flash cards give you short, repeated review sessions that provide immediate feedback. Use the front of a 3-by-5-inch index card to write a word, idea, or phrase you want to remember. Use the back for a definition, explanation, and other key facts. Key 6.4 shows two flash cards used to study for a psychology exam.

Here are some suggestions for making the most of your flash cards:

- **Use the cards as a self-test.** As you go through them, divide them into two piles—the material you know and the material you are learning.

- **Carry the cards with you and review them frequently.** You'll learn the most if you start using cards early in the course, well ahead of exam time.

- **Shuffle the cards and learn the information in various orders.** This will help you avoid putting too much focus on some items and not enough on others.

- **Test yourself in both directions.** First, look at the terms and provide the definitions or explanations. Then turn the cards over and reverse the process.

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**Key 6.4** Flash cards help you memorize important facts

**THEORY**

- Definition: Explanation for a phenomenon based on careful and precise observations
- Part of the scientific method
- Leads to hypotheses

**HYPOTHESIS**

- Prediction about future behavior that is derived from observations and theories
- Methods for testing hypotheses: case studies, naturalistic observations, and experiments
Chapter 6

Reduce the stack as you learn. Eliminate cards when you are sure of your knowledge. As you watch the pile shrink, your motivation will grow. As test time approaches, put all the cards together again for a final review.

Use Audio Strategies

Although all students can benefit from these strategies, they are especially useful if you learn best through hearing.

Create audio flash cards. Record short-answer study questions and leave 10 to 15 seconds between questions, so you can answer out loud. Record the correct answer after the pause for immediate feedback. For example, part of a recording for a writing class might say, “Three elements that require analysis before writing are . . . (10- to 15- second pause) . . . topic, audience, and purpose.”

Use podcasts. Audio segments that are downloadable to your computer or MP3 player, podcasts are especially helpful to students who learn best through listening. Ask your instructors if they intend to make any of their lectures available in podcast format. Podcasts with coaching tips are available on MyStudentSuccessLab.

Use the Information

In the days after you learn something new, try to use the information in every way you can. Apply it to new situations, and link it to problems. Explain the material to a classmate. Test your knowledge to make sure the material is in long-term memory. “Don’t confuse recognizing information with being able to recall it,” says learning expert Adam Robinson. “Be sure you can recall the information without looking at your notes for clues. And don’t move on until you have created some sort of sense-memory hook for calling it back up when you need it.” As you will see next, mnemonic devices create sense-memory hooks that are difficult to forget.

Inside Tips from Joyce, Technology Coach

Several technology tools exist to support your memory. Electronic flash cards enable you to copy and paste articles from the Web and organize them as you would a stack of 3-by-5 cards (example: www.flashcardexchange.com). Another useful tool is mind-mapping software, which enables you to outline your information in a visual way and then turn the visual diagram into a formal outline at the click of a button (example: www.gliffy.com).
On a scale of 1 to 10, with 1 being the lowest and 10 being the highest, rate yourself on your memory skills. Then indicate where you want to be at the end of this course.

<table>
<thead>
<tr>
<th>MEMORY SKILL</th>
<th>RATING NOW</th>
<th>RATING GOAL</th>
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</thead>
<tbody>
<tr>
<td>Making emotional connections with material</td>
<td></td>
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<tr>
<td>Understanding what you memorize</td>
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<td>Using critical thinking</td>
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<tr>
<td>Using rehearsal techniques</td>
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<tr>
<td>Chunking and organizing material</td>
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<tr>
<td>Getting enough sleep</td>
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<tr>
<td>Making a smart study schedule</td>
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<tr>
<td>Practicing material in the middle</td>
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<tr>
<td>Using flash cards</td>
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<td>Using digital recordings and podcasts</td>
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<tr>
<td>Using what you just learned</td>
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<tr>
<td>Using different mnemonic devices</td>
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**How Can Mnemonics Boost Recall?**

Certain performers entertain audiences by remembering the names of 100 strangers or flawlessly repeating 30 ten-digit numbers. Although these performers probably have superior memories, they also rely on memory techniques, known as mnemonic devices (pronounced neh-MAHN-ick), for assistance. Mnemonics include visual images, associations, and acronyms.

Mnemonics depend on vivid associations (relating new information to other information) that engage your emotions. Instead of learning new facts by rote (repetitive practice), associations give you a “hook” on which to hang these facts and retrieve them later. Mnemonics make information unforgettable through unusual mental associations and visual pictures.

Mnemonics take time and effort to create, and you’ll have to be motivated to remember them. Because of this, use them only when necessary—for instance, to
distinguish confusing concepts that consistently trip you up. Also know that no matter how clever they are and how easy they are to remember, mnemonics have nothing to do with understanding. Their sole objective is to help you memorize.

Create Visual Images and Associations

Turning information into mental pictures helps improve memory, especially for visual learners. To remember that the Spanish artist Picasso painted *The Three Women*, you might imagine the women in a circle dancing to a Spanish song with a pig and a donkey (pig-asso). The best images involve bright colors, three dimensions, action scenes, inanimate objects with human traits, and humor.

Here is another example: Say you are trying to learn some Spanish vocabulary, including the words *carta*, *río*, and *dinero*. Instead of relying on rote learning, you might come up with mental images such as those in Key 6.5.

Use Visual Images to Remember Items in a List

Using the *mental walk* strategy, you imagine storing new ideas in familiar locations. Say, for example, that on your next biology test you have to remember the body’s major endocrine glands. To do this, think of your route to the library. You pass the college theater, the science center, the bookstore, the cafeteria, the athletic center, and the social science building before reaching the library. At each spot along the way, you “place” a concept you want to learn. You then link the concept with a similar-sounding word that brings to mind a vivid image (see Key 6.6):

- At the campus theater, you imagine bumping into the actor Brad Pitt (pituitary gland).
- At the science center, you visualize a body builder with bulging thighs (thyroid gland).

### Key 6.5  Visual images aid recall

<table>
<thead>
<tr>
<th>SPANISH WORD</th>
<th>DEFINITION</th>
<th>MENTAL IMAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>carta</em></td>
<td>letter</td>
<td>A person pushing a shopping cart filled with letters into a post office.</td>
</tr>
<tr>
<td><em>río</em></td>
<td>river</td>
<td>A school of sharks rioting in the river. One of the sharks is pulling a banner inscribed with the word <em>riot</em>. A killer shark bites off the <em>t</em> in <em>riot</em> as he takes charge of the group. “I’m the king of this river,” he says.</td>
</tr>
<tr>
<td><em>dinero</em></td>
<td>money</td>
<td>A man eating lasagna at a dinner. The lasagna is made of layers of money.</td>
</tr>
</tbody>
</table>
A mental walk helps you remember items in a list.
● At the campus bookstore, you envision a second body builder with his **thighs** covered in **mustard** (thymus gland).

● In the cafeteria, you bump into **Dean Al** (adrenal gland).

● At the athletic center, you think of the school team, the Panthers—nicknamed the Pans—and remember the sound of the cheer “**Pans-R-Us**” (pancreas).

● At the social science building, you imagine receiving a standing **ovation** (ovaries).

● And at the library, you visualize sitting at a table taking a **test** that is **easy** (testes).

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**TAKE ACTION**

Create Your Own Mnemonic

Identify material you have to memorize for a course. Then complete the following:

Create a mnemonic to help you memorize the details. (If you need more space, use separate paper.)

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Describe the images you used in the mnemonic. Were they visual images? Were they sounds? Were they humorous, ridiculous, or colorful?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Why do you think these types of images help you retain information? How did they tap into your visual or your musical intelligence?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
Create a Vocabulary Cartoon

Visual cartoons use the DAP method—definition, association, and picture—to harness the power of humor to remember challenging vocabulary. Use the following steps to create your own vocabulary cartoons:

**Step 1.** Write down the new vocabulary word followed by its pronunciation and definition. For example:

- **word:** histrionic
- **pronunciation:** (his tree AHN ik)
- **definition:** overly dramatic, theatrical

**Step 2.** Think of a link word—an association—that rhymes with your word or sounds like it:

- **association:** history

**Step 3.** Create a picture or simple cartoon with the main word and the link word, to serve as a visual mnemonic. Then write a caption that connects the word you are trying to learn with the link word and visually illustrates its meaning:

  “Professor Bradley liked his history on the histrionic side—with a lot of theatrics.”

**Step 4.** Use the word in sentences of your own:

- The histrionic child threw herself on her bed when she didn’t get her way.
- The histrionic actor’s portrayal of the calm professor did not ring true.

Create Acronyms

Another helpful association method involves **acronyms**. In history class, you can remember the Allies during World War II—Britain, America, and Russia—with the acronym BAR. This is an example of a word acronym, because the first letters of the items you want to remember spell a word. The word (or words) spelled don’t necessarily have to be real words. See Key 6.7 for an acronym—the name Roy G. Biv—that will help you remember the colors of the spectrum.

Other acronyms take the form of an entire sentence, in which the first letter of each word in each sentence stands for the first letter of the memorized term. This is called a list order acronym. When astronomy students want to
remember the list of planets in order of their distance from the sun (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune), they might learn this sentence: *My very elegant mother just served us nectarines.*

Suppose you want to remember the names of the first six U.S. presidents. You notice that the first letters of their last names—Washington, Adams, Jefferson, Madison, Monroe, and Adams—together read W A J M M A. To remember them, first you might insert an e after the J and create a short nonsense word—*wajemma*. Then, to make sure you don’t forget the nonsense word, you might picture the six presidents sitting in a row and wearing pajamas.

**Use Songs or Rhymes**

Some of the classic mnemonics involve rhymes. This one helps you remember a spelling rule:

> I before E, except after C, or when sounded like A as in “neighbor” and “weigh.” Four exceptions if you please: either, neither, seizure, seize.

Make up your own poems or songs, linking familiar tunes or rhymes with information you want to remember. Thinking back to the “wajemma” example, imagine that you want to remember the presidents’ first names as well. You might set those first names—George, John, Thomas, James, James, and John—to the tune of “Happy Birthday.” Or, to extend the history theme, you might use the first musical phrase of the national anthem.
### Multiple Intelligence Strategies to Boost Your Memory

Briefly describe a memory problem that you’re having in one of your courses.

Now brainstorm potential solutions to your problem, linking each solution to an intelligence. Use the right-hand column to record your ideas.

<table>
<thead>
<tr>
<th>INTELLIGENCE</th>
<th>SUGGESTED STRATEGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Verbal-Linguistic</strong></td>
<td>■ Develop a story line for a mnemonic first, then work on the visual images.</td>
</tr>
<tr>
<td></td>
<td>■ Write out answers to practice essay questions.</td>
</tr>
<tr>
<td><strong>Logical-Mathematical</strong></td>
<td>■ Create logical groupings that help you memorize knowledge chunks.</td>
</tr>
<tr>
<td></td>
<td>■ When you study material in the middle, link it to what comes before and after.</td>
</tr>
<tr>
<td><strong>Bodily-Kinesthetic</strong></td>
<td>■ Create a mnemonic story board on a poster board.</td>
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<tr>
<td></td>
<td>■ Tape the board to a wall and walk back and forth as you memorize.</td>
</tr>
<tr>
<td></td>
<td>■ Record information onto a digital recorder and listen as you walk between classes.</td>
</tr>
<tr>
<td><strong>Visual-Spatial</strong></td>
<td>■ Focus on visual mnemonics such as mental walks or vocabulary cartoons.</td>
</tr>
<tr>
<td></td>
<td>■ Use markers to add color to the images.</td>
</tr>
<tr>
<td><strong>Interpersonal</strong></td>
<td>■ Do flash-card drills with a study partner.</td>
</tr>
<tr>
<td></td>
<td>■ Recite critical material to a study partner.</td>
</tr>
<tr>
<td><strong>Intrapersonal</strong></td>
<td>■ Listen to an audio podcast that reviews test material.</td>
</tr>
<tr>
<td></td>
<td>■ Create vocabulary cartoons and test yourself on the material.</td>
</tr>
<tr>
<td><strong>Musical</strong></td>
<td>■ Play music while you brainstorm ideas.</td>
</tr>
<tr>
<td></td>
<td>■ Create a mnemonic in the form of a musical rhyme.</td>
</tr>
<tr>
<td><strong>Naturalistic</strong></td>
<td>■ Organize what you have to learn so that you know how everything fits together.</td>
</tr>
<tr>
<td></td>
<td>■ Sit outside and go through your flash cards.</td>
</tr>
</tbody>
</table>

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Memory

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Why Do You Need a Good Memory When You Have the Internet?

With computers, smartphones, and wireless connections bringing the Internet to you whenever you need it, it is reasonable to ask why memorization skills are important when you can look almost everything up. The best answer is because the reservoir of facts in your long-term memory powers your intellectual potential. With a well-stocked reservoir that is constantly being replenished, you can put new ideas together and think of unique approaches to problems. With one that is nearly empty, you are a blank slate.

A final thought: The facts that you store in your memory help define who you are as a person and can lead to fulfilling academic, career, and life choices. If you love baseball and memorize World Series statistics, for example, your passion will make an impression on everyone you meet and will communicate something meaningful about you to friends, teachers, and prospective employers.

QUESTIONS

Powerful Questions

Dr. Linus Pauling used his memory of an obscure scientific fact to make a major discovery about the chemical bond and how proteins are structured—one that would win him the Nobel Prize for Chemistry. He made this breakthrough while doodling during a long train ride, which created the environment for an “aha” moment that would change modern medicine.8

Have you ever put important ideas together during unexpected times—during a morning shower or an afternoon run, while cooking dinner or looking through a digital photo album? Why do you think unrelated sensory experiences lead to new ideas?
As an airline pilot, “good memorization skills helped me to quickly become familiar with thousands of pages of flight manuals, aircraft limitations, procedures, terminology, etc. I’m sure ‘good memorizers’ in other professions feel the same way.”

Jim Erdos, from a letter in response to a newspaper article on why memorizing sports trivia is good for the brain

Habit for Success

**put your senses to work**

Below are examples of how you can put this habit into action in different situations. Use the three spaces to add your own ideas for actions you can accomplish now or in the future. Be specific, and be realistic.

- Learn new vocabulary by creating funny images that are hard to forget.
- Memorize math principles by listening to rhymes on mathraps.com and creating your own raps.
- Play soothing music to create a positive study environment.
- Note an instructor’s body language and voice tone to pick up hints about information he or she considers important.
- Put a hand on a sick friend’s head to see if she is running a fever.
Note the Important Points

How does memory work?
Describe two reasons why memory is the basis for learning.

Describe what each of the following does in the information processing model of memory:
sensory registers
short-term memory
long-term memory

How can you improve your memory?
Describe three memory strategies you learned in this chapter that you are likely to start using.
1.
2.
3.

How can mnemonics boost recall?
Explain how mnemonic devices help you remember material.

Describe two different types of mnemonics you learned about in the chapter that you are likely to use.
1.
2.
Why do you need a good memory when you have the Internet?
Explain why it is important to “know something” even when you can easily look it up.


Critical Thinking

Evaluate Your Memory in Three Different Areas

Next to these classifications of information in long-term memory, write down two examples from your personal experience:

Episodic memory (events)
Sample: I remember the first time I conducted an experiment in chemistry class.
Example #1: ____________________________________________________________
Example #2: ____________________________________________________________

Declarative memory (facts)
Sample: I know that the electoral college must vote before a new U.S. president is officially elected.
Example #1: ____________________________________________________________
Example #2: ____________________________________________________________

Procedural memory (motion)
Sample: I know how to type without looking at the keyboard.
Example #1: ____________________________________________________________
Example #2: ____________________________________________________________

Which type of memory is easiest for you to remember over a long period of time?

Memory

Which type of memory is hardest for you to remember over a long period of time?

Most exams test declarative memory. List three actions you can take when you study for your next exam to improve your declarative memory.

1. 
2. 
3. 

---

**Team Building**

**collaborative solutions**

**Assess Your Memory and Then Boost Its Power**

Gather as a class if there are fewer than 20 people, or divide into two groups if it is larger. Then do the following. (You’ll need a timer or a stopwatch.)

- Each person in your group should place at least one item on a table (try to avoid repeats). When all the items are laid out, allow one minute to look at them.
- Then cover the items and have each person list as many items as possible.
- Compare the lists to the actual items to see how you did.
- Talk as a group about the results, what you didn’t remember and why, and what helped you remember. List your observations here and on a separate sheet, if necessary.

Now repeat the exercise using a mnemonic device. For example, create a new group of items, and then allow five minutes to look at them and to develop a mnemonic in that time. Then cover the items and make lists again. Finally, talk about whether this helped you remember more items. Write your findings here.
Improve Your Memory for Test Success

Nearly every student has memory challenges that affect test grades. But nearly every student also has the ability to improve. Start here:

Describe your biggest memory challenge that limits your ability to remember test material.

________________________________________________________________________

________________________________________________________________________

Describe two strategies you learned in this chapter that you will use to get better test results. Focus on engaging your senses.

1. ______________________________________________________________________
   ______________________________________________________________________

2. ______________________________________________________________________
   ______________________________________________________________________

Now use these techniques to improve your grade on an upcoming test:

Course and date of test: ____________________________________________________

Date when you will use each technique. (Place a checkmark in the box after you use it.)

Technique #1: ____________________________________________________________

Technique #2: ____________________________________________________________

Evaluate the results: How do you think these techniques improved your test performance?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Time for a Change: take steps to improve a habit for success

For this exercise, refer back to the results of the assessment you took in Chapter 1 on page 19.

First: Write the second of your three strongest Habits for Success here (a different strong habit than the one you explored on page 93).

Why does it work for you? Name a result of this habit that helps you solve problems and move toward important goals.

Now: Write the second of your three least developed Habits for Success here (a different habit than the one you explored on page 93).

Why do you want to develop this habit—in other words, what positive effect do you think it will have on your ability to solve problems and achieve goals?

Focus on this challenging habit more carefully. Name two specific, short-term actions you can take to power up this habit. (Refer to the actions you listed in Chapter 1’s Take Action exercise on page 14 if they connect to this habit).

1. 

2. 

Name a support person, and briefly describe your plan for communicating your progress and getting encouragement (for example, have your person call, e-mail, or text you on a regular basis).
Remember, the way to make a habit stick is to do it over and over again over a period of at least 21 days. Right now, commit to checking your progress on a regular basis over the next three weeks, using whatever method you prefer.

Describe the method you will use to track your habit development.

What will you use? (example: date book, electronic planner, cell phone alarm, e-mail alert)

When and how often will you use it? (example: every day at bedtime, every other day when I get up, twice a week after a particular class)

It's time for a change—put your plan in motion today. You will revisit your progress at the end of Chapter 9 (page 277) as well as in Chapter 12.

Revisit Your Progress

Look back at the Time for a Change exercise at the end of Chapter 3 on page 93. Take a moment to describe how you have developed this habit, including how consistently you perform your chosen actions, how well you document your progress, the helpfulness of your support system, and whether you are satisfied with your progress. If you are not satisfied, describe how you will adjust your actions in order to move ahead.