The goal of this book is to improve your logical-reasoning skills. Your logical-reasoning skills are a complex weave of abilities that help you get someone's point, generate reasons for your point, evaluate the reasons given by others, decide what or what not to do, decide what information to accept or reject, explain a complicated idea, apply conscious quality control as you think, and resist propaganda. Your most important critical thinking skill is your skill at making judgments—not snap judgments that occur in the blink of an eye, but those that require careful reasoning.

You are not reasoning logically if, when you want a gorilla suit for a Halloween party, the first thing you do is search for the word "Gorilla" in the Yellow Pages of the telephone book.

High-quality reasoning is called logical reasoning or critical thinking. Logical reasoning is a skill that can be learned and improved. It is not a case of "Either you're naturally good at it or you're not." Rather, every student is capable of reasoning well, and everyone is capable of improvement. The opposite of logical reasoning is uncritical thinking, examples of which are fuzzy thinking, believing what somebody says simply because they raise their voice, and narrowly thinking about a problem without bringing in the most relevant information.

This first chapter explains what it means to be logical—to reason logically. It demonstrates the usefulness of logical reasoning as a means to making more effective decisions about your own life—decisions about what to believe and decisions about what to do. The chapter begins a systematic program of study of all the major topics regarding logical reasoning. Along the way, the book focuses on developing the following five skills: (1) writing logically, (2) detecting inconsistency and lack of clarity in a group of sentences, (3) spotting issues and arguments, (4) detecting and avoiding fallacies (reasoning errors), and (5) generating and improving arguments and explanations. These skills will be taught here independent of subject matter.
This book does not emphasize philosophy over any other subject, and it is not a book about what you ought to believe about some subject.

Although many scientific studies of decision making have shown that people tend to sift sources of information to reinforce existing views rather than to accept the view that is backed up with the better argument, our course is designed to combat this tendency.

**Facing a Decision as a Critical Thinker**

Imagine this situation. You are on a four-day backpacking trip in a national wilderness area with your friends Juanita and Emilio. The summer weather's great, the scenery is exotic, and you've been having a good time. Yesterday you drove several hours into the area and parked in the main parking lot. Then you hiked six hours to your present campsite. The three of you carried all your food, water, sleeping bags, and tents.

Last night you discovered that somebody had accidentally cracked the large water container. Now you are stuck with no water. Although there is a stream nearby, you wouldn’t normally drink from a stream, and you remember that your packets of water-sterilization tablets are in
the pocket of your other coat—the one you left at home at the last minute. The three of you are thirsty and have only dehydrated food left, except for four apples. You wish you had bothered to haul in that twelve-pack of Dr. Pepper you decided to leave in the car’s trunk.

What do you do? Nobody brought cell phones. You could yell, but that is unlikely to help; you haven't seen any other hikers since the trip began. You try it, but all you get is an echo. You briefly think about snow, but realize there isn't any. Emilio says he has an idea: Boil the water from the stream. When it cools, you could drink it and make breakfast and continue with your good times. Then Juanita mentions seeing a sign back in the parking lot:

"Warning, Giardia has been found in many streams in the area. Sorry, but we are out of sterilization tablets."

"Giardia is a microorganism that makes you sick," she says. You and Emilio have never heard of it. Emilio says he's willing to bet that boiling the water will kill the critters. "Besides," he says, "our stream might not have Giardia. I'll take the first drink." Juanita winces. "No, don’t do that," she says. "Let's just pack up and go home." When you ask her why, she explains that a friend of hers got Giardia and had a bad experience with it. She doesn't want to risk having the same experience. When you hear the details, you understand why. The symptoms are chronic diarrhea, abdominal cramps, bloating, fatigue, and loss of weight. "Also," she says, "the park signs about Giardia are probably posted because the organisms cannot be killed by boiling." However, she admits that she isn't sure of her interpretation of the sign, and she agrees with Emilio that the nearby stream might not even contain Giardia, so she decides to do whatever the majority wants. She adds that the three of you might get lucky while you are hiking out and meet someone who can help, maybe a hiker who knows more about Giardia or has extra water-sterilization tablets. Then again, you might not be so lucky; you didn't pass anybody on the way in. Hiking out while you all have a bad case of Giardia might even be life threatening.

Emilio agrees to go along with the majority decision, too. He wants to stay, but not by himself. Still, he isn't convinced by Juanita's reasons. "Look," he says, "if the stream were poisonous, everything in it would look dead. There are water spiders and plants in the stream. It's no death trap."

At this point you are faced with one of life's little decisions: What do you do about the water situation? Go or stay? Someone else might make this decision by flipping a coin. A logical reasoner is more rational, that is, reasonable.
A first step in logical reasoning is often to get some good advice. You already have some advice, but how do you decide whether it's any good? There is one best way to identify good advice: It can be backed up with good reasons. Juanita's advice to go back home is backed up by these reasons: (1) the consequences of getting giardia are pretty bad, and (2) the posted signs probably indicate that boiling won't work. Unfortunately, she is not sure about the boiling. So the burden falls on your shoulders. Can you back up her reasoning even if she can't? Or can you show that her reasoning isn't any good?

One way to support a statement is to point out that the person making it is an expert. So you think about Juanita's and Emilio's credentials. Let's see—Juanita is a student majoring in psychology, and Emilio is a communications major and works at a pet store. Does that make them authorities on Giardia and the safety of drinking water? No. So if you need an expert, you will have to search elsewhere.

But you ask yourself is it really worth your trouble to search for more information from an expert? The search will probably require a hike back to the ranger station near the parking lot. Besides, if the expert's advice is to avoid drinking the boiled water unless you have sterilization tablets, then you'll have to hike all the way back to camp to tell the others and then start the process of packing up and hiking out. It would be a lot easier just to follow Juanita's advice to pack up and leave now.

So what do you decide to do? Let's say you decide not to search for more advice, and you recommend boiling the water and drinking it when it cools. You now owe it to Juanita and Emilio to give them the reasons behind your decision.

Your first reason is that you discounted Emilio's remark that if the stream were poisonous then everything in it would look dead. Deadly things can be alive and look healthy. You mention salmonella on delicious turkey burgers. You are certain that there are microbes that harm humans but not plants and fish; crabgrass and catfish do not catch cholera.

Your second reason comes from reconsidering that sign at the ranger station. If nothing works to kill Giardia, then you wouldn't even have been allowed into the park or would have been warned in person. The sign said the station is out of sterilization tablets, implying that sterilizing the water will make it safe. Safe in what sense? Sterilizing means to kill or remove all the living organisms, but not necessarily all the harmful chemicals. If you were to sterilize water containing gasoline, that wouldn't make it safe to drink. So the problem is definitely the microorganisms. Now surely the rangers know that hikers are apt to try to sterilize water by boiling it. You reason that if boiling wouldn't work, the sign would have said so. Then you vaguely remember hearing that people in Africa were told to boil drinking water to prevent cholera, and you think cholera is caused by a parasite or bacteria or something living in the water. Could cholera be that different from Giardia, you wonder. Thinking about all this you conclude it is likely that boiling will do the trick. So, Juanita’s worry about the danger of getting
a bad disease such as Giardia is more than offset by the low probability of actually getting the disease.

That's how you have made your decision. Is it a reasonable one? Yes, because it is based on high-quality reasoning. Is it the best decision—the one an expert would have made in your place? You don’t know this, but yes, the experts do say that stream water will be safe if you boil it for a minute or two. Giardia is caused by protozoa which can’t live for long at high temperature. Other micro-organisms can survive this heating, but they usually won’t cause any human illness. The reason people use water-purification tablets is for convenience; using the tablets avoids all the extra time for the water to boil and then cool to drinking temperature.

Now let's turn to the principles of logical reasoning that have been used in the situation. The principles, which are the focus of the next section, are neither rules nor recipes; they are pieces of advice that must be applied flexibly. They are called "principles" only because it sounds odd to call something "piece of advice eleven" or "thing to do seven."

**Advice for Logical Reasoners**

All of us use these principles every day, so this discussion is just a reminder of what you already know. One principle is to ask for reasons before accepting a conclusion, unless you already have good enough reasons. You applied this principle when you asked Juanita why she thought it best to leave. Similarly, if you expect people to accept your own conclusion, then it's your responsibility to give them reasons they can appreciate.

If you expect people to accept your own conclusion, then it's your responsibility to give them reasons they can appreciate.

Let's examine that last remark. A conclusion backed up by one or more reasons in any order is called an **argument**, even when the reasoner is not being argumentative or disagreeable. The word “argument” is a technical term we will be using frequently in this course. Being logical means that you should give an argument to support your conclusion if you expect other people to accept it. Give people arguments with reasons they can understand. Don't get overly technical. Otherwise, you might as well be talking gobbledygook. Tailor your reasons to your audience. Your goal in giving an argument is to design your reasons so that your audience sees
that the reasons imply the conclusion. Another way of saying this is that your audience should see that the conclusion follows from the reasons given to support it.

CONCEPT CHECK

Which of the following passages contain an argument in our technical sense of that word?

a. I hate you. You’re worthless! Get out of here!

b. I'm sure Martin Luther King Jr. didn't die during the 1960s, because it says right here in the encyclopedia that he was assassinated in Memphis in 1990.

c. The Republican Party began back in the 1850s as a U.S. political party. Abraham Lincoln was their first candidate to win the presidency.

d. I don’t believe you when you say Martin Luther King Jr. could have been elected president if he hadn’t been assassinated.

Try to discipline yourself to read and answer these sample exercises before looking up the correct answer in the footnote below, and before reading on. You do not need to write out the answer. The exercises are designed to test your understanding of concepts in the material you have just read. If you can answer the Concept Checks, then you will be ready to tackle the more difficult Exercises at the end of each chapter.

1 For any Concept Check, and many more are coming, try to resist quickly looking down to the footnote for the answer until after you’ve thought seriously about how to answer the question. The answer is (b). Choice (a) does show two people having a disagreement, but neither one is arguing, because neither is giving reasons for what is said. Choice (c), on the other hand, merely describes the Republican Party. The word “because” in (b) indicates that a reason is being stated. The conclusion is that Martin Luther King Jr. didn’t die during the 1960s. You can tell from this passage that the conclusion is not about the speaker’s degree of certainty in this, so that is why the phrase “I’m sure” is not part of the conclusion. The argument’s conclusion—that Martin Luther King Jr. didn't die during the 1960s—follows from the reason given, even though the reason is based on faulty information. (King actually died in 1968.) One moral to draw from this is that an argument based on wrong information is still an argument. A second moral is that an argument can have just one reason. A third moral is that even though this argument does satisfy the principle that an argument's reasons should imply its conclusion, if those reasons are faulty the argument fails to establish its conclusion.
Let's continue with our introduction to the principles of logical reasoning. (There are quite a few more to be uncovered.) For example, in the camping-trip story, you paid attention both to what Juanita said and to what Emilio said, and you wished there was a park ranger nearby to ask about Giardia. The underlying principle you applied is to recognize the value of having more relevant information. In the camping situation, it would not have been irrational to choose to pack up and go home, but it probably wouldn’t have been the best decision. The point is to make your decision on the basis of a serious attempt to assess the relevant evidence. You did this when you paid attention to probabilities and consequences — you weighed the pros and cons— of going or staying.

Here's a picture of what to do. Think of a balance scale for where objects can be placed on either side of the scale. Put the pros on one side and the cons on the other. After all the pros and cons are assessed and added onto the scale, the winner is the side that tilts downward. Some considerations weigh more than others, so it's not just a matter of which side has a longer list of reasons. Weighing means considering how much you'd gain or lose if one of the consequences were to occur. Also, you should consider how probable it is that a particular consequence would really occur. Don't give much weight to a possible consequence that is one in a million.

More precisely stated, weighing the pros and cons is a decision procedure that requires

1. considering the possible courses of action (pack up and hike back out, stay and boil the water, go on a search for a berry tree or a wet leaf to lick),

2. guessing the consequences of those various courses of action (being thirsty, continuing the camping trip, getting a disease),

3. evaluating those consequences (being thirsty is a negative, continuing the camping trip is a positive, getting a disease from Giardia would be terrible), and
(4) considering the probabilities that those various consequences will actually occur (it is 100 percent probable that you won't be thirsty after you drink from the stream, but it is only very slightly probable that you'll catch a disease if you drink boiled water that has cooled off and that is unlikely to contain dangerous chemicals such as gasoline).

It can be helpful to delay making important decisions when that is practical. During the extra time, you will have an opportunity to think through the problem more carefully. You could discover consequences of your decision that you might not have thought of at first. For example, in the camping situation with Emilio and Juanita, you might have quickly agreed to let Emilio taste the water first to see whether it had Giardia. Perhaps only later would you have thought about the consequence of his becoming too sick to hike back out of the forest. Would you have been able to carry him?

Faced with a question of what to do or believe, logical reasoners try to weigh the pros and cons if they have the time; they search around for reasons that might favor their conclusion while knowingly hiding anything negative. That is, they identify the reasons in favor of taking a specific position on the issue, and they identify the reasons against taking that position; then they weigh the two sets of reasons and arrive at a conclusion fairly.

Here is a second example of logical reasoning that weighs the pros and cons. Imagine that a few days ago you promised Emilio you would go to the movies with him this Friday evening. You have every intention of going, but you are mildly considering going with Juanita instead, and telling Emilio you are sick. Telling him you are sick while instead going with Juanita would be called an alternative course of action. Let's weigh the pros and cons of taking the original action or this alternative course of action. (We won't consider other alternative actions, such as asking Emilio whether Juanita can go with the two of you.)

One possible consequence of going only with Juanita is that you would have more fun. It's not that you would have no fun with Emilio; it's just that you believe it would be more fun to go only with Juanita, all other things being equal. You estimate that the odds are about 60-40 in favor of more fun if you go with Juanita instead of Emilio. Another possible consequence is that Juanita will at first be flattered that you asked her to go with you.

There is still another possible consequence to consider: You will be breaking your promise to Emilio, which would be morally wrong and thus have a negative value. It wouldn't be as negative as letting Emilio drink water that you know will cause a disease, but it is clearly negative, and the probability of this consequence is 100 percent; that is, it is certain to occur if you tell Emilio you are sick. In addition, if Emilio finds out, then your friendship with him might end. This is also a negative, and one that is likely to occur, although it is not certain because Emilio might be a very forgiving person. Finally, there is one more consequence worth considering: If Juanita finds out, she will consider you less trustworthy than she originally
thought. This is a negative, too. At this point, you cannot think of any other consequences that should be taken into account.

After pondering all this, you realize that it is likely that most of the negative consequences will actually occur if you do go with Juanita and that it's only about sixty percent likely that you will have more fun with Juanita than with Emilio. So the negatives weigh more than the positives. After weighing the pros and cons of the two alternatives this way, you decide to keep your promise to Emilio. This is logical reasoning in action.

A critical thinker doesn't always use the procedure of weighing the pros and cons. Weighing the pros and cons will give you a good answer only in limited situations where you know the important consequences of your potential actions and where you have enough time to consider those consequences. In many situations, the best thinking requires taking shortcuts--making quick guesses or relying on a trusted friend to make the decision for you.

Logical reasoners need to be flexible thinkers. For example, in a situation where you're playing baseball and a friend yells "Duck!" it is illogical to spend much time searching around for good reasons. The logical thing to do is to duck down immediately. Nevertheless, even in this situation you didn't duck without a good reason. You know from previous experience that "Duck" said in a certain tone of voice means that there is a danger to your head that requires lowering it fast and protecting it from a sudden impact. You know not to stick your head up and say "Where's the duck?" Similarly, if someone were to run out of the Wells Fargo Bank building shouting, "Look out, the bank is being robbed," it wouldn't be logical to spend much time wondering what river bank the person is talking about. The point is that logical reasoners assess what is said in light of the situation. Be sensitive to the situation. If you happen to know what time it is when someone passes you on the street and asks "Do you know the time?" it is illogical to answer only "Yes" and walk away unless you are trying to irritate the person who asked the question.

Real life decision-making often must work in a dynamic, unpredictable environment. In the business world, new competitors appear, prices rise or fall, opportunities that were available at one time or not available at another. The uncritical decision maker is unaware of these changes and continues to work on making a decision as if in the old environment. This is paralysis by analysis. Alert decision makers also understand the need to know when time is getting short and a decision is needed. This sort of recognition requires frequently asking in the background “Should I continue to weigh the pros and cons, or should I put the decision making on hold and look for new information, or should I stop and act now?”

The less time available, the more rational it becomes to be reactive and act on intuitions.
CONCEPT CHECK

Ramone's friend says, "Ramone, look at those two white guys on the other side of the street. They look friendly. The blond guy with him looks like he would rip your lungs out just to see what would happen. The other one is just as fierce, and he's carrying the radio I lost yesterday; it's got my sticker on the side."

If Ramone leaves believing that the two guys are friendly because his friend said, "They look friendly," then he has violated some principle of logical reasoning. What principle?

- Reasons should be tailored to the audience.
- Don't take people too literally.
- Consider the possible courses of action.
- Weigh the pros and cons.

Like everyone else, you are curious, so you are open to adding new beliefs to your old beliefs. There are logical—that is, appropriate—ways of doing this, as well as illogical ones. The goal is to add truths, not falsehoods. For example, you are waiting in the grocery store checkout line and notice the front-page headline, "World War II Bomber Discovered Intact on Surface of Moon." You didn't know that, did you? Well, it wouldn't be logical to believe it. Why not? Here are three reasons: (1) Bombers can't fly to the moon, (2) no one is going to bust the national budget to send one there by rocket ship, and (3) there aren't any alien-piloted UFOs that snatch military antiques. The principle behind this logical reasoning is:

Use your background knowledge and common sense in drawing conclusions.

There is a Calvin and Hobbes cartoon in which Calvin finds some charred rocks and ashes in his back yard and claims this is dramatic proof that UFOs landed in his backyard. That cartoon also demonstrates this principle of logical reasoning:

2 The second choice is correct. From what else the friend says, you should be able to tell he was being sarcastic and wasn't serious about the two guys being friendly. He didn't mean for his statements to be taken literally.
Extraordinary statements require extraordinarily good evidence to back them up.

A bit of charcoal is not extraordinarily good evidence of a UFO landing. Similarly, if I were to say to you, “I met my friend Tiffany Whetstone at the Co-op Grocery yesterday afternoon,” you would demand little evidence that this is so. Perhaps the confirming word of a mutual friend would settle any doubts you might have. However, if I were to say to you, “I met my friend Tiffany Whetstone, who has been dead for the last ten years, at the Co-op Grocery yesterday afternoon,” you would probably think I was lying or crazy. You certainly would demand extraordinarily good evidence before accepting what I said as true. In this case, even a confirmation by our mutual friend would be insufficient evidence. However, suppose I said instead, “I met my friend Tiffany Whetstone at the Co-op Grocery yesterday afternoon. She has a wooden leg and had just won two sets yesterday in her doubles tennis match. She is the best player on her tennis team in Antarctica.” This statement is not as weird as the one about her being dead for ten years, and it wouldn't take as much to convince you of this truth, if it were true. But confirmation by our mutual friend would still not be good enough evidence. It is still a very weird remark.

By not relying on the principles of logical reasoning, some people are apt to make the mistake of believing too easily that there are antique airplanes on the moon, that UFOs have landed in someone’s backyard, and that dead friends have come back to life. All these things might have happened, but currently available evidence is extremely weak. The only reason to believe these things is that a few people have said they’ve happened. And you have lots of background beliefs and common sense that suggest these things probably did not happen.

It is a sign of being logical if the degree of confidence you have in your reasons directly affects the degree of confidence you place in the conclusion drawn from those reasons. A person who believes strongly even though the reasons are flimsy is being stubborn or dogmatic.

CONCEPT CHECK

Here are three arguments about the issue of how David’s uncle died. All three are arguing for the same conclusion—that David’s uncle died of a drug overdose. Which of these arguments should be considered the most convincing, using only your background knowledge and common sense?

a. David said that his uncle died of a drug overdose, so his uncle must have died of a drug overdose.
b. We know David's uncle died of a drug overdose because David predicted two years ago that this is how his uncle would die and because David has a good track record of making correct predictions.

c. Look, the coroner's report specifically says that David's uncle is dead. Also, everybody in the neighborhood knows that the uncle did drugs every day. So, his uncle died of a drug overdose.

3

Following the rules of logical reasoning comes more easily to some people than to others. All of us, however, are capable of improvement, and we all should want to improve, because improvement has a yield, a payoff. Being logical isn't the only way to make high quality decisions. Sometimes these decisions are made by accident; sometimes they are made in illogical ways, such as by following a horoscope. In the long run, however, statistics show that the smart money is on logical reasoners. Logical reasoning pays. When the expert says, "Hey, don't drink that stuff; it could kill you," the logical reasoner will defer to the expert and put down the cup. The irrational thinker will think, "Experts have been wrong in the past; I'm drinking anyway."

Everyone knows that the best decisions are based on facts, but how do we go about distinguishing facts from everything else that is said to us? This book provides many helpful hints on this topic. One hint is to avoid accepting inconsistencies; they are a sign of error. We made use of this logical-reasoning principle when we noticed that Juanita's advice to end the camping trip was inconsistent with Emilio's advice to continue it. Detecting an inconsistency doesn't reveal where the fault lies, but it does tell us that a fault is present. If someone says the surface of Neptune on average is colder than 200 degrees below zero, and his sister says that it's not nearly that cold, one of the two must be wrong about the facts. We know this even if we don't know the facts about Neptune. So one of the cardinal principles of logical reasoning is:

Be consistent in your own reasoning and be on the lookout for inconsistency in the reasoning of others.

3 Answer (a) provides the best reason to believe that David's uncle died of a drug overdose. Although the world has lots of liars in it, we generally take people at their word unless we have a reason to be suspicious. Answers (b) and (c) give worse reasons. Answer (b) asks us to believe David's prediction from two years earlier. It makes more sense to trust what David is saying today (which is what we have in answer (a)) than what he said two years ago about the future. Answer (c) gives us good reason to believe that the uncle is dead but gives us no information about the cause of death. Maybe the uncle did drugs but got hit by a truck. So, answer (a) is best. (The best answer would be the coroner's report on what caused the death.)
Here is a definition of inconsistency:

**Definition** Statements are *logically inconsistent* if they conflict so that at least one of them must be false since they imply something is so and also not so. Similarly, a group of instructions is inconsistent if together the instructions imply that somebody must both do and not do something.

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**CONCEPT CHECK**

Which of the following, if any, are most likely not principles of logical reasoning?

- Don’t accept inconsistent beliefs.
- You ought to give an argument in defense of what you want another person to believe.
- The degree of confidence you have in your reasons should affect the degree of confidence you have in your conclusion.

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Statements are logically inconsistent with each other if you can tell just from their meaning that they can’t all be true. A group of statements is *logically consistent* if it’s not logically inconsistent. Because a statement is usually made with a declarative sentence, we speak of sentences being consistent or inconsistent with each other. Also, normally we drop the word “logically.”

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**CONCEPT CHECK**

Create two statements about basketball that are inconsistent with each other.

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4 All are principles of good reasoning.

5 Michael Jordan is a basketball player, but he's not. Notice that this places two statements within one sentence, and strings them together with the word “but.”
Examples of Good Reasoning

So far we've explored the importance of reasoning logically in situations that require a decision — either a decision about what to do or a decision about what to believe. Along the way we've introduced a variety of rules of thumb for good reasoning, that is, high-quality reasoning. We have called these principles of logical reasoning. We have examined short examples of good reasoning and short examples of bad, or illogical, reasoning. The Giardia example was the only long example of good reasoning.

Here is a second long example—one that is slightly more complicated and uses some other especially interesting principles of good reasoning. The scene is a jury room in which jurors are discussing whether Jesse Mayfield is guilty of armed robbery. The State of Alabama, represented by the prosecutor, has charged Mayfield with using a handgun to hold up the All-Night Grocery in downtown Birmingham.

Juror Washington Jones begins the dialogue by reasoning about the case presented by the prosecuting district attorney against Mayfield. Another juror, Dr. White, disagrees with what juror Jones says. Each of the two speakers offers his own argument about which explanation of the defendant's actions is best.

Jones: OK, let's consider what the prosecutor's got here. We know there was a crime, since we can believe the grocery owner's testimony that all the night's receipts are missing. The grocery
clerk confirmed his story. She is the lone eyewitness to the crime; there were no others in the store at 2 a.m., when she said the crime was committed. The grocery's videotaping system had been broken all week. The prosecutor has also proved that Mayfield arrived at the grocery that night at about that time. The evidence for that is that the time was on the grocery receipt found in the wastebasket when the police arrested Mayfield at his house that morning. Mayfield matches the general description of the robber given by the clerk at 2:30 a.m., when she talked to the police. So we've got to conclude that Mayfield was in the store at 2 a.m. and that the robbery occurred before 2:30 a.m., probably at 2 a.m. The clerk also stated that the robber ran out of the store and headed into a nearby apartment complex. Mayfield lives in an apartment in the direction she pointed to. A neighbor told the police that Mayfield ran up his apartment's steps sometime around 2 a.m. that night. What else do we know that can be considered as evidence against Mayfield? Let's see. Mayfield has no record of robbery, but he was convicted of minor assault against a neighbor six years ago. Well, that's about it. Does that make the case for the prosecution?

Dr. White: Yes, he's guilty; there's no other explanation for the evidence. I say we vote right now.

Jones: Hold it, Doc. There is another explanation, and Mayfield's defense attorney gave it to us. Maybe Mayfield was there all right, but just to buy a bottle, and then the clerk stole from her boss after Mayfield left. She could have hidden the cash and called the cops. The whole case against Mayfield hangs on what she alone says. Mayfield says he is innocent, but he admits being in the store in the early morning to buy whiskey. The prosecutor admitted that none of the stolen money was found, and no gun was found. So all the facts fit that other explanation as well as the prosecution's explanation. Besides, there is an additional reason to suspect the clerk: The defense has shown that she was thrown out of her college sorority for stealing their petty cash. I say the defense attorney has shown that Mayfield could have been framed. Sure, there's some evidence against Mayfield, but not enough.

Dr. White: Mayfield is as guilty as sin. He won't even look the judge or the prosecutor in the eye when they talk to him. Very suspicious. You left that out of the story, Jones. Mayfield's an alcoholic, too. Think of the number of crimes committed by alcoholics. They need that next drink, right? Also, even though he now admits being in the All-Night Grocery that morning, Mayfield lied about being there when he was first arrested, didn't he?

Jones: Yes, but what does that prove? He was arrested with his wife present, which is why he lied about being there, according to his defense attorney. He said she wouldn't let him buy whiskey with her money. Now, about that guilty look. Guilty looks don't make you guilty. I can think of ten reasons why he looks that way. The case against Mayfield isn't proven, at least not beyond a shadow of a doubt. Better that five robbers go free than one innocent person gets locked up. What do the rest of you jurors think?
Dr. White: That's just crap! He's guilty! Jones, you can't call that nice young white clerk a liar. It's Mayfield who's the liar!

If this is supposed to be an example of good reasoning, what is so good about it? First, Jones uses the following principle of logical reasoning when he is explaining the facts of the robbery case: Explanations should fit all the relevant facts. Second, Jones demonstrates good reasoning in that he understands his responsibility to back up his conclusion that the case against Mayfield isn't sufficiently strong. Jones backs it up by showing that a second explanation, the frame-up story, fits the facts. In doing so, he listens to the opposition, tries to consider all the evidence, and weighs the pros and cons. By pointing to the defense attorney’s explanation of the facts and cautioning his fellow jurors that the DA has not presented enough evidence, Jones uses a key principle of logical reasoning: Your opponent's explanation is less believable if you can show that there are alternative explanations that haven't been ruled out. Jones demonstrates an understanding of the fact that weaker reasons require a more cautious conclusion; he doesn't rush to judgment. He is careful to follow this principle: Don't draw a conclusion until you've gotten enough evidence. Jones obeys another principle of logical reasoning: Stick to the subject. White goes off on a tangent, talking about alcoholism and whether Mayfield looked the judge and DA in the eye. The comment about the clerk being white is also irrelevant, and probably racist. On the other hand, all of Jones's remarks are relevant.

There is much more that could be said regarding the reasoning in this robbery case. We won’t pursue this case study any more, but in later chapters we will explore all the principles of logical reasoning that were mentioned.

This book is concerned with many other kinds of reasoning, not just with argumentation. For example, when you are trying to summarize a complicated explanation of allowable deductions on I.R.S. income tax form 1040 Schedule C, you are not arguing, but you are doing some critical thinking. Your critical thinking skills also involve assessing whether a group of sentences are consistent, whether a proposed definition is successful, whether an advertisement gives any useful information about a product, whether a speaker is being fair in a debate with an opponent, whether a statistical sample was biased, and whether someone's supposed scientific explanation is unscientific. This book is designed to improve all these other critical thinking skills, too, even though they don't directly involve arguments.

**Review of Major Points**

Logical reasoning is your guide to good decisions. It is also a guide to sorting out truth from falsehood. This chapter began with several case studies of logical reasoning. It also pointed out some common errors in reasoning. From these examples we were able to extract the following **principles of logical reasoning**: (1) ask for reasons before accepting a conclusion, (2) give an
argument to support your conclusion, (3) tailor reasons to your audience, (4) design your reasons to imply the conclusion, (5) recognize the value of having more relevant information, (6) weigh the pros and cons, (7) consider the possible courses of action, (8) look at the consequences of these various courses of action, (9) evaluate the consequences, (10) consider the probabilities that those various consequences will actually occur, (11) delay making important decisions when practical, (12) assess what is said in light of the situation, (13) don't take people too literally, (14) use your background knowledge and common sense in drawing conclusions, (15) remember that extraordinary statements require extraordinarily good evidence, (16) defer to the expert, (17) remember that firmer conclusions require better reasons, (18) be consistent in your own reasoning, (19) be on the lookout for inconsistency in the reasoning of yourself and others, (20) check to see whether explanations fit all the relevant facts, (21) you can make your opponent's explanation less believable by showing that there are alternative explanations that haven't been ruled out, (22) stick to the subject, and (23) don't draw a conclusion until you’ve gotten enough evidence.

These principles are merely pieces of advice; they are not rules or recipes. All the points, principles, and problems discussed in this chapter will receive more detailed treatment in later chapters. Those chapters will continue to systematically explore the intricacies of being logical. Although not all the logical principles in the world will be introduced in this book, all the most important ones will be. Regarding the problem of whether some are more important than others: not to worry; the relative importance of the principles will become clear as we go along.

As you investigate arguments during the course, you will improve the following skills:

- RECOGNITION of arguments
- EVALUATION of arguments
- CREATION of arguments

“Critical thinking is skeptical without being cynical. It is open-minded without being wishy-washy. It is analytical without being nitpicky. Critical thinking can be decisive without being stubborn, evaluative without being judgmental, and forceful without being opinionated.”

--Peter Facione
Glossary

**argument** An argument is a conclusion backed up by one or more reasons. In this sense of “argument,” there is no requirement that there be two people who disagree about anything.

**critical thinking**: Critical thinking is when you turn off your mind, relax, and float downstream. Hmm. Not such a good definition, is it? Maybe you can do better.

**inconsistent** [Chapter 9 is devoted to this concept.]

**issue** The specific point of disagreement that inspires someone to present an argument. The argument’s conclusion normally favors one side of the issue over the other.

**topic** The general area of the issue. If the issue is whether Americans prefer southern European food to northern European food, then the topic might be American taste preferences.

**weigh the pros and cons** In deciding on taking an action, you weigh the pros and cons by looking at the probable good consequences of the action and the probable bad consequences. It’s a kind of cost-benefit analysis.

Exercises

1. Write a short essay that weighs the pros and cons and then comes to a decision about whether there should be more or less publication celebration on Columbus Day, October 12, an American holiday. Here is some relevant background information to reduce your research time. Columbus was a brave explorer, an adventurer, a breaker of new ground. Unlike Leif Ericson of Norway and other explorers who also visited the Western Hemisphere before Columbus, Columbus was the European who caused large numbers of other Europeans to follow him to the hemisphere. He was integral in causing the Western hemisphere to now have such a history of European culture. He brought new technology and new religion that spread throughout the hemisphere. He sent attack dogs to maul naked Indians, seized Caribbean women as sex slaves, and disemboweled other natives who resisted conquest. Many were hanged, some were burned alive. He chopped off the hands of thousands who were slow in producing the gold he wanted. Many Arawak Indians responded by committing a series of mass suicides. He shipped 500 Arawak Indians back on Europe as slaves, although 200 died on the voyage. He brought Western diseases which spread across North and South America, almost depopulating what is now California. He helped convince many people that the Earth is round. Thanks to Columbus, the wheel and the domesticated horse entered Western civilization.
2. Suppose your family has decided it needs a new car. Also, suppose your family has enough money to buy a car, although cost is a factor or something to consider. You have been asked to make all the other decisions, such as which car to buy, how and where to buy it, what financing to use, and so forth. Create — that is, make up — the primary reasons for buying the car: to use in the family business, as a second car that is always available to take your live-in Aunt Mary to the doctor twice a week, or to be the family's primary car. Make your situation realistic; don't, for example, have your primary reason be to have a getaway car for a bank robbery. Once you’ve created the situation, make recommendations to your (pretend) family. Describe how you went about making your decision. Include details, starting with what sources of information you used to help you with your decision. Concentrate on being clear in expressing yourself and on trying to make a logical (that is, rational) decision.

3. During the rest of the school term, collect examples of reasoning that you find in your own experience. Sources might be web pages, newspaper or TV ads, magazine articles, conversations, books, and so on. Cut out, photocopy, or write up each example on a regular-size page (8.5 x 11 inches). Below each example (or on an accompanying page) identify where it came from, including page number and the date of publication or broadcast. Then identify the reasoning that occurs, and defend your identification. Your goal should be fifteen examples. Staple your fifteen pages together in the upper left corner, adding a cover page containing your name and class hour. The best journals will be those that contain a wide variety of examples of ideas from this chapter and future chapters, such as (a) examples of deceptive techniques by advertisers, salespersons, and propagandists, (b) examples of reasoning errors discussed in later chapters, (c) examples of violations of several principles of good reasoning or good criticism, and (d) examples of good reasoning.

4. For the following hypothetical situation, state what decision you recommend and why you recommend it. Weigh the pros and cons.

A West Virginia radio telescope recently detected an unusual signal beamed in our direction from somewhere across the Milky Way galaxy. After six months of study by the world's best scientists, it is agreed that the signal comes from an intelligent source and contains the message which says, when translated into English, "Can you hear us? Describe yourself and where you are located." The continuously repeating message also includes a very brief description of the other civilization, indicating that they are a hydrocarbon-based life form that lives on two planets around a central star. Their signal gave no indication they know we exist. You, a leading government official, have been asked by your president for your opinion about how or whether Earth should respond to the message.6

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6 Here are some helpful hints on this question. How expensive would a response be? What’s to be gained from making contact? Would it make any difference if they were a predator
5. Assume the quotation contains a sensible argument with a word or phrase taken out and replaced with a blank. Choose the best way to fill in the blank.

"Juan’s envelope has got to be here somewhere ______ I had it when I left class, I had it when I ate lunch after class, I had it when I was getting in the car to drive here, and I know I didn't drop it until I got in here. The envelope is a mystery, but it can't just disappear, can it?"

a. but suppose
b. therefore
c. because
d. but it’s not the case that
e. and?

6. Select some decision you made this week and write a short essay (under two pages, typed double-spaced) in which you explicitly weigh the pros and cons of making the choice you made as opposed to alternative choices you might have made.

7. Weigh the pros and cons of whether to sign up; for an Internet version of a college course instead of the regular version in which you sit in a classroom in front of the instructor.

8. Consider Emilio's reason for drinking the untreated stream water: “Look, if the stream were poisonous, everything in it would look dead. There are water spiders and plants in the stream. It’s no death trap.” Which statement below best demonstrates the weakness of Emilio’s argument in favor of drinking the water?

a. In arguments, some statements are true; some are false. You cannot always tell which.

b. Some things that will kill water spiders won’t kill the plants, and vice versa.

c. Many things that are harmful to humans are not harmful to water spiders.

d. Before making a decision one should weigh the pros and cons, yet Emilio isn’t considering the pro side of his position, namely that water spiders and plants need water, too.

9. In weighing the pros and cons of the camping situation with Emilio and Juanita, you considered whether to pack up and go home, stay and boil the water, or hike for help. If you civilization? What are the chances we could ever meet them? Are they more likely to be less advanced than us, or more advanced?

7 Answer (c).
failed to notice that Juanita had hiked in with a cell phone which you could use to call for information about giardia, then you would have failed to

a. consider all the possible courses of action.
b. identify the consequences of the course of action.
c. evaluate the consequences of the course of action.
d. consider the probability that the consequences will occur.

10. In weighing the pros and cons of the camping situation with Emilio and Juanita, you considered whether to pack up and go home, stay and boil the water, or hike for help. If you failed to notice that if you stayed and boiled the water, then you couldn’t drink it right away but would have to wait until it cooled, then you would have failed to then you would have failed to then you would have failed to

a. consider all the possible courses of action.
b. identify the consequences of the course of action.
c. evaluate the consequences of the course of action.
d. consider the probability that the consequences will occur.

11. In weighing the pros and cons of the camping situation with Emilio and Juanita, you considered whether to pack up and go home, stay and boil the water, or hike for help. You briefly noticed that, if you stayed, then you might all become sick. However, suppose you failed to notice how bad this would be. For example, you might need medical treatment but be too sick to go for help. So, in weighing the pros and cons, you failed to

a. consider all the possible courses of action.
b. identify the consequences of the course of action.
c. evaluate the consequences of the course of action.
d. consider the probability that the consequences will occur.

12. In weighing the pros and cons of the camping situation with Emilio and Juanita, you considered whether to pack up and go home, stay and boil the water, or hike for help. Suppose you considered packing up and hiking home and noticed that you could get very thirsty on the hike back. If you failed to notice that you definitely would get very thirsty in this situation, then you would have failed to

a. consider all the possible courses of action.
b. identify the consequences of the course of action.
c. evaluate the consequences of the course of action.
d. consider the probability that the consequences will occur.