Chapter 1

Logic Games: Fun or Frightening?

In This Chapter

- Exploring the test
- Understanding why logic games are tricky for most people
- Knowing the basic parts and types of logic games
- Getting familiar with some common logic game variations
- Seeing three important logic game strategies

The Analytical Reasoning test — Logic Games, for short — is the hardest part of the LSAT. There, I've said it. I suppose I could soften these words a bit: *For most people*, the Logic Games section is the hardest part of the LSAT. But whichever way I say it, the question still remains: Why do otherwise smart people flee in terror at the thought of spending 35 minutes doing logic games? And what, beyond the mystique, are logic games really all about?

In this chapter, I explore these questions. I begin by discussing the type of thinking — usually not covered in school — that logic games demand. After that, I give you some basic information about logic games. I show you how to begin setting up a game board, your main tool for organizing the logical information you find in logic games. I introduce you to the two most basic types of logic games — line games and sorting games.

I also give you an overview of some of the common variations on these themes, which I cover throughout the book. To finish up, I give you a quick look at three strategies for solving logic games, which I cover in greater depth later in the book.

The Logic Games Part of the LSAT

The Law School Admission Test (LSAT) is required for entrance into virtually any accredited U.S. law school. It's offered four times a year — in February, June, September, and December — and it includes six sections:

- One Reading Comprehension Test (35 minutes)
- Two Logical Reasoning Tests (35 minutes each)
- One Analytical Reasoning (Logic Games) Test (35 minutes)
- One Unscored Test, which is used for new-question development; it can be any of the preceding tests, but it doesn't count toward your LSAT score (35 minutes)
- One Writing Sample (30 minutes)

The LSAT scoring system ranges from a low score of 120 to a perfect score of 180. The four sections of the LSAT have a total of 100 questions. The Logic Games section usually includes 23 questions, but this number can range from 22 to 24. That means that about 23 percent of your LSAT score depends on your ability to do these logic puzzles.

The LSAT is an old-fashioned (that is, not computerized) standardized test: The questions are presented in a paper booklet, and you're required to answer them using a No. 2 pencil on a fill-in answer sheet. The downside of this format is that it limits your scrap paper to whatever white space is available on the four pages of that section of the test itself. This constraint isn't much of an issue on the other sections of the LSAT, but it can be annoying on the Logic Games section because you nearly always have to draw one or more charts to answer the questions.

You have 35 minutes to complete the Logic Games section. The test includes four logic games, each of which has from five to eight questions. Each question has five possible answers — (A), (B), (C), (D), or (E). One answer is right, and the other four are wrong.

There's no penalty for wrong answers on the LSAT, so be sure to answer *every* question, even if you have to guess. Improve your chances by eliminating some of the wrong answers first.

For more advice on preparing for and taking the LSAT, check out *LSAT For Dummies* (Wiley). Throughout the rest of this chapter and the book, I focus exclusively on the Logic Games section.

Why Logic Games Are Tricky — and What You Can Do about It

The Logic Games section of the LSAT differs from the other sections of the LSAT in two key ways:

- **Logic games are completely self-contained.** That means that knowing facts such as the quadratic formula, the atomic number of cadmium, or the capital of Burkina Faso won't help you solve them.
- **Logic games require pure deductive reasoning, a type of thinking that's not typically covered in school.** Most of the other skills you've attained in school, such as reading complicated material quickly, analyzing and formulating arguments, or writing with clarity and conviction — the stuff you're already good at — don't help you much with logic games. Why is deductive reasoning so difficult? Well, it isn't — except for the fact that you've hardly ever done it.

Look at it this way: Most things you do well — such as reading, assimilating information, and writing persuasively — you figured out how to do slowly over a period of time. If you'd spent even one hour a week in school on problems in deductive reasoning, you'd wouldn't need this book — or maybe you'd be writing it. But most people have virtually no training in deductive logic. Actually, the designers of the LSAT Logic Games are banking on this fact. The test is conceived to be, as much as possible, a test of raw reasoning.

Logic games are an odd mix of skills: reading, note-taking, organizing apparently disparate information, and systematically ruling out what's false and clarifying what's true. But step back a moment, and you'll see that these skills are all essential to the study and practice of law. Furthermore, you already possess most if not all of them. You just need a way to apply them to the novel task of answering questions about logic games.

Just because schools don't tend to focus on the skill of deductive reasoning doesn't mean you can't attain it, hone it, and even excel at it. I've never met a college graduate who was constitutionally unable to do logic games. If you're like most people, though, you need a bridge to get from where you are right now to a place where your natural intelligence and intuition kick in. When you do, logic games begin to look simpler because you begin to see patterns you previously missed. Remember, your competition on the test has exactly the same problem with it that you do. So more than any other test you've ever taken or are likely to take, preparation is essential.

If you spend even 20 or 30 hours practicing logic games, you'll have a major advantage over those who merely try a few examples before taking the test. My goal in this book is to make this study time as productive as possible. Taking practice tests can help you measure your skill at logic games, but it does little to help you build and improve these skills. In fact, repeatedly trying and failing to solve four logic games in 35 minutes can actually decrease your score by convincing you that you're somehow not cut out for logic games or, by extension, law school.

If you read this book, follow along with the examples, and then try out the practice problems on your own, you'll get a feel for them that you didn't know was possible. At that point, the practice tests in Chapters 15 through 17 will start to make sense, and taking them will strengthen you rather than discourage you. When you understand how to approach logic games, I highly recommend that you purchase some LSATs and take them under timed conditions as part of your study. The Law School Admissions Council (LSAC; `www.lsac.org`) publishes "actual, official" LSATs that were used in the past, and you can use them as practice tests.

What All Logic Games Have in Common

Recently, in an SAT-prep class that I was leading, one student said of a particular type of question, "After you do enough of them, you start to see that they're all the same." If I could impart a single insight to any student facing a standardized test, this would be it: After a while, all the questions are the same.

For one thing, every logic game has the same basic structure. Each game involves the following:

- A story, which gives you basic information on how to play the game
- A set of clues, which give you some organizational rules
- Five to eight multiple-choice questions, sometimes with an extra clue that applies only to a single question

Together, the story, clues, and questions give you what you need to play the game. They identify your game tokens, describe the board, outline the rules you need to win, and then challenge you with questions. From there, racking up the points is mostly a matter of placing game tokens, which I call *chips,* in the right order on the board you've drawn usually a box chart.

Generally speaking, the more chips you can place into the boxes, the better chance you have of being able to answer the questions correctly. To accomplish this goal, use the logical information from the story and clues.

The most useful type of clue allows you to place one or more chips directly into the boxes. I call these clues *ringers*. Other types of clues aren't quite so user-friendly, so you need to keep track of the information they provide by using clue notes.

When a question provides an extra clue, you may be able to put additional information in the box chart. The extra clue applies only to that question, so draw a copy of your game board — a *question chart* — before plugging in that information.

In Chapter 2, I walk you through the basics of getting information from clues into the boxes. And in Chapters 3 and 5, I introduce you to the most common types of clues and show you how to handle each type.

The Common Varieties of Logic Games

Although all logic games have a lot in common, as I discuss earlier in this chapter, you see quite a bit of variation among logic games. Becoming familiar with the most common variations can help you solve them with greater speed and accuracy. In this section, I give you an overview of the ways I classify the common differences among logic games.

Identifying the two main types of logic games

First, logic games can be divided generally into two types, line games and sorting games:

- **Line game:** A line game asks you to arrange chips in order, from first to last. Here are some examples:

  Seven people standing in line at the supermarket

  A schedule of plays produced in eight consecutive months

  A contest in which the top six players are ranked

- **Sorting game:** A sorting game asks you to separate chips into two or more groups. Here are some sorting-game examples:

  Deciding which four out of eight neckties to take on a trip

  Choosing four officers from a group of nine nominees

  Dividing a group of ten children into three cars

Some of the more-difficult logic games have aspects of both line games and sorting games. But when you understand how the both types of games work, you begin to see strategies that can apply to more-complex games. I introduce line games in Chapter 3 and sorting games in Chapter 5.

Opening up to open-board logic games

Open-board line games and open-board sorting games are common variations on the two main types of logic games. In this section, I show you how to recognize open-board games.

Understanding open-board line games, relatively speaking

A line game is an *open-board line game* when the clues provide very little information about the absolute position of the chips in the line and lots of information about their relative position. The following examples show how the types of information compare:

Absolute Position	*Relative Position*
Marty is standing third in line.	Marty is standing immediately behind Sarah.
Elise will be interviewed at 4:00.	Elise will be interviewed sometime after Benjamin.
The carpenter will arrive on Thursday.	The carpenter and the plumber will arrive on consecutive days, not necessarily respectively.

A clue that gives *relative* information fails to mention exact position, time, or day. Instead, the clue provides information about where two chips are in the line in relation to each other.

Generally speaking, open-board line games are tougher than regular line games, because they aren't as easy to solve using a regular box chart. In Chapter 8, I give you techniques and tips for handling open-board line games.

Understanding open-board sorting games

A sorting game is an *open-board sorting game* when the story and clues don't tell you the number of chips to be placed in each group. Generally speaking, open-board sorting games are tougher than regular sorting games, because the number of boxes in most or all of the groups is unknown.

For example, a sorting game about eight actors trying out for a play is an open-board game if the story doesn't tell you how many actors landed a role. Instead, this type of game may place one or more *constraints* on the number of actors chosen. For example, the story may tell you that at least two actors were chosen and at least two weren't chosen. I show you how to take on open-board sorting games in Chapter 9.

Extras: Becoming one with non-1-to-1 games

Many logic games are *1-to-1 games* — that is, they have the same number of chips and boxes, with exactly one chip to be placed in each box. The best way to see this is with an example:

> A daycare center has eight children — F, G, H, J, K, M, N, and P. The children are lined up at the door for recess, from first to eighth, with no two children standing together.

In this game, the chips are the eight children and the boxes are the eight positions in line. Each child has exactly one position in the line, so a completed box chart for this game would have exactly one chip in each box.

Some logic games, however, are more tricky *non-1-to-1* games — that is, you can't assume that exactly one chip is to be placed in each box, with no chips left over. There are four basic varieties of non-1-to-1 games, which I discuss in detail in Chapters 10 and 11. In this section, I give you a brief description of each variety. In some cases, a single game may allow more than one of these possibilities.

Dealing with more boxes than chips

Sometimes, a logic game appears to have only a few chips and too many boxes. In that case, you either use some chips more than once or leave some boxes empty. This type of game falls into two categories:

- **Repeated chips:** In this type of game, you can place a single chip into more than one box. Here's an example of a repeated-chip game:

  > Geoff has brought three suits — blue, gray, and tan — on an eight-day business trip. He plans to wear one of these three suits every day, though never wearing the same suit on two consecutive days.

  This game has three chips (the three suits — B, G, and T) and eight boxes (the eight days — Day 1 through Day 8). Because each suit may be worn more than once, the chips are repeated chips. A game with repeated chips can be tricky because in most cases, the number of times each chip is repeated can vary.

- **Empty boxes:** In some logic games, at least one box remains empty, with no chip placed in it. Here's an example:

  > Over seven consecutive weeks, Marnie had four different houseguests — J, K, L, and M. Each guest stayed for exactly one of the seven weeks, and no guest stayed during the other three weeks.

  This game has four chips (the four houseguests — J, K, L, and M) and seven boxes (the seven weeks — Week 1 through Week 7). This time, each chip is placed into exactly one box, with three empty boxes left over. Games with empty boxes introduce additional uncertainty into a logic game.

I discuss ideas for handling repeated chips and empty boxes in Chapter 10.

Having more chips than boxes

Some logic games give you more chips than boxes. In those games, either some boxes can hold more than one chip, or you don't use some of the chips. Here are the two types of these games:

- **Multiple chips:** Test-makers introduce another wrinkle in logic games when you can put more than one chip into a single box. See the following example:

  > Seven people — Maurice, Nona, Patrice, Quentin, Rosie, Stefano, and Theresa — are driving to a restaurant in a caravan of four consecutive cars. Each car contains at least one but no more than three people.

  This game has seven chips (the seven people — M, N, P, Q, R, S, and T) and four boxes (the four cars — first through fourth). You may place as many as three chips into any box, so this game includes multiple chips. Games with multiple chips are especially tricky because they introduce a new factor of uncertainty.

- **Orphan chips:** A logic game can include one or more chips that you don't place into any of the boxes. For example

  > A recruiter for a job is considering eight applicants named Shroeder, Tompkins, Usher, Vasquez, Wallings, Xenakis, Young, and Zaneski. She interviews four of these applicants, scheduling their interviews for 1:00, 2:00, 3:00, and 4:00.

  This game has eight chips (the eight applicants — S, T, U, V, W, X, Y, and Z) and four boxes (the four time slots — 1:00 through 4:00). In this game, only four of the eight chips go into boxes, and the rest are left out — that is, they're *orphan chips*. Games with orphan chips are complicated because they include elements of both line games and sorting games.

I show you how to deal with multiple chips and orphan chips in Chapter 11.

Not every logic game that has the same number of chips and boxes is a 1-to-1 game. For example, a game about a woman who has five meetings in five days might not be a 1-to-1 game: The story may state that from zero to two meetings take place on each of the five days. That is, this game allows both empty boxes and multiple chips. The moral should be clear: Always read the story very carefully to determine at the outset whether a logic game is a 1-to-1 game.

Leaping to another dimension with 2-D games

Many line games and sorting games necessitate a box chart with only a single row of boxes. In some cases, however, a logic game requires an extra degree of organizational power. Here's an example:

> A convention has scheduled programs by nine different presenters: H, J, K, M, N, O, P, R, and T. Each presenter is scheduled for either morning, afternoon, or evening on one of three consecutive days — Thursday, Friday, or Saturday.

This game is really a *two-dimensional* (*2-D*) *game*: a game requiring a box chart that has both rows and columns, much like a calendar. The chart for the example game includes the following:

- **Three rows:** The three time slots — morning, afternoon, and evening
- **Three columns:** The three days — Thursday, Friday, and Saturday

This chart would contain a total of nine boxes, with exactly one chip to be placed in each box. As you can imagine, 2-D games add a level of complexity to logic games. I show you how to handle a variety of 2-D games in Chapter 12.

Three Setup Strategies

Virtually every logic game requires a certain amount of *preliminary setup* — that is, organizing the information from the story and clues into a game board. Beyond this, however, you may benefit from more or less *strategic setup* — that is, improving upon the game board before answering some or all of the questions.

Here are the basic ideas behind three important setup strategies for solving logic games:

- **Looking for keys:** A *key insight* is an important conclusion that you can draw based on the story and clues that allows you to enter information into your box chart. Some key insights may be fairly obvious, but others can be very tricky to find. In most cases, discovering a key insight makes answering some or all of the questions a whole lot easier.
- **Splitting the chart:** Some logic games provide very little information that you can place directly into your box chart. One way to handle this type of game is with a *split chart* — a box chart with two or more rows. Each row in a split chart includes all the information you have for that game plus an *assumption* — a piece of information that could be true. Splitting the chart allows you to explore a set of *scenarios,* which are all the possible outcomes for that game. I introduce split charts in Chapter 7.
- **Making a total enumeration:** Sometimes the clues in a logic game provide such a wealth of information that the number of possible scenarios is quite limited. The best way to handle this type of problem is with a *total enumeration* — an exhaustive accounting of every possible outcome for that game.

  Total enumeration can be time-consuming, but if you use it wisely, this strategy can provide you with a game board that allows you to answer virtually any question quickly, accurately, and with minimal effort. I discuss the strategy of total enumeration in Chapter 13.