CONTENTS

CHAPTER ONE: INTRODUCTION

CHAPTER TWO: LINEAR GAMES

CHAPTER THREE: ADVANCED LINEAR GAMES

CHAPTER FOUR: GROUPING GAMES

CHAPTER FIVE: GROUPING/LINEAR COMBINATION GAMES

CHAPTER SIX: PURE SEQUENCING GAMES

CHAPTER SEVEN: THE FORGOTTEN FEW

CHAPTER EIGHT: ADVANCED FEATURES AND TECHNIQUES

CHAPTER NINE: SECTION STRATEGY AND MANAGEMENT

APPENDIXES

ENDNOTES

About PowerScore

PowerScore is one of the nation's fastest growing test preparation companies. Founded in 1997, PowerScore offers LSAT, GMAT, GRE, SAT, and ACT preparation classes in over 150 locations in the U.S. and abroad. Preparation options include Full-length courses, Weekend courses, Live Online courses, and private tutoring. For more information, please visit our website at www.powerscore.com or call us at (800) 545-1750.

For supplemental information about this book, please visit the Logic Games Bible website at www.powerscore.com/gamesbible. The website contains additions to the text and answers to questions submitted by students.

About the Author

Dave Killoran, a graduate of Duke University, is an expert in test preparation with over 20 years of teaching experience and a 99th percentile score on a LSAC-administered LSAT. In addition to having written PowerScore's legendary LSAT Bible Series, and many other popular publications, Dave has overseen the preparation of thousands of students and founded two national LSAT preparation companies.

CHAPTER ONE: INTRODUCTION

Introduction

Welcome to the *PowerScore LSAT Logic Games Bible*. The purpose of this book is to provide you with a complete and cohesive system for attacking the Analytical Reasoning section of the Law School Admission Test (LSAT). By carefully studying and correctly applying the techniques we employ, we are certain that you will increase your Analytical Reasoning score.

In an effort to clearly explain the fundamental principles of the Analytical Reasoning section (also known as *Logic Games*), each chapter of this book contains a variety of drills, explanations, and Logic Games. The explanations and drills have been created by the staff at PowerScore, makers of the world's best LSAT preparation courses. The techniques in this book have been tested in live classes, through individual tutoring, and on the LSAT itself. Each Logic Game comes from an actual LSAT and is used with the permission of LSAC, the producers of the LSAT. We feel the use of real Logic Games is essential to your success on the LSAT, and no game in this book has been modified from its original form on the LSAT.

Each part of this book has been designed to reinforce your understanding of the concepts behind the Logic Games section. In order to effectively and efficiently apply our methods, we strongly recommend that you carefully read and then reread each of the discussions regarding game recognition, rule diagramming, and inference production. Also, we suggest that as you finish each question you look not only at the correct answer choice, but also at the incorrect answer choices. Look again at the problem and determine which elements led to the correct answer. Study the explanations and setups provided in the book and check them against your own work. By doing so you will greatly increase your chances of scoring high on the Logic Games section.

Finally, in our LSAT courses, our admissions counseling programs, and in our publications, we always strive to present the most accurate and up-to-date information available. Consequently, we have devoted a section of our website to *Logic Games Bible* students. This free online resource area offers supplements to the book material, answers questions posed by students, offers study plans, and provides updates as needed. There is also an official book evaluation form that we strongly encourage you to use. The exclusive *LSAT Logic Games Bible* online area can be accessed at:

www.powerscore.com/gamesbible

If you are looking to further improve your LSAT score, we also recommend that you pick up a copy of the renowned PowerScore LSAT Logical Reasoning Bible. The Logical Reasoning Bible contains our system for attacking the Logical Reasoning section of the LSAT. When combined with the Logic Games Bible, you will have a formidable methodology for attacking the test. The LSAT Logical Reasoning Bible is available through our website at www.powerscore.com and at fine retailers everywhere.

Additionally, if you wish to discuss this book with other students and ask questions of the author, please visit our LSAT discussion forum at:

forum.powerscore.com/lsat

If we can assist you in your LSAT preparation in any way, or if you have any questions or comments, please do not hesitate to email us at lgbible@powerscore.com. Additional contact information is provided at the end of this book. We look forward to hearing from you!

A Brief Overview of the LSAT

The Law School Admission Test is administered four times a year: in February, June, September/October, and December. This standardized test is required for admission to any American Bar Association-approved law school. According to LSAC, the producers of the test, the LSAT is designed "to measure skills that are considered essential for success in law school: the reading and comprehension of complex texts with accuracy and insight; the organization and management of information and the ability to draw reasonable inferences from it; the ability to think critically; and the analysis and evaluation of the reasoning and arguments of others." The LSAT consists of the following five sections:

• 2 Sections of Logical Reasoning (short arguments, 24-26 questions each)
• 1 Section of Reading Comprehension (3 long reading passages, 2 short comparative reading passages, 26-28 total questions)
• 1 Section of Analytical Reasoning (4 logic games, 22-24 total questions)
• 1 Experimental Section of one of the above three section types.

You are given 35 minutes to complete each section. The experimental section is unscored and is not returned to the test taker. A break of 10 to 15 minutes is given between the 3rd and 4th sections.

The five-section test is followed by a 35 minute writing sample.

The Logical Reasoning Section

Each Logical Reasoning Section is composed of approximately 24 to 26 short arguments. Every short argument is followed by a question such as: "Which one of the following weakens the argument?" "Which one of the following parallels the argument?" or "Which one of the following must be true according to the argument?" The key to this section is time management and an understanding of the reasoning types and question types that frequently appear.

Since there are two scored sections of Logical Reasoning on every LSAT, this section accounts for approximately 50% of your score.

The Analytical Reasoning Section

This section, also known as Logic Games, is probably the most difficult for students taking the LSAT for the first time. The section consists of four games or puzzles, each followed by a series of five to eight questions. The questions are designed to test your ability to evaluate a set of relationships and to make inferences about those relationships. To perform well on this section you must understand the types of games that frequently appear and develop the ability to properly diagram the rules and make inferences.

At the conclusion of the LSAT, and for five business days after the LSAT, you have the option to cancel your score. Unfortunately, there is no way to determine exactly what your score would be before cancelling.

The Reading Comprehension Section

This section is composed of three long reading passages, each approximately 450 words in length, and two shorter comparative reading passages. The passage topics are drawn from a variety of subjects, and each passage is followed by a series of five to eight questions that ask you to determine viewpoints in the passage, analyze organizational traits, evaluate specific sections of the passage, or compare facets of two different passages.

The Experimental Section

Each LSAT contains one undesignated experimental section, and it does not count towards your score. The experimental can be any of the three section types described above, and the purpose of the section is to test and evaluate questions that will be used on *future* LSATs. By pretesting questions before their use in a scored section, the experimental helps the makers of the test determine the test scale.

The Writing Sample

A 35-minute Writing Sample is given at the conclusion of the LSAT. The Writing Sample is not scored, but a copy is sent to each of the law schools to which you apply. In the Writing Sample you are asked to write a short essay that defends one of two possible courses of action.

Do not agonize over the Writing Sample; in law school admissions, the Writing Sample is not a major determining element for three reasons: the admissions committee is aware that the essay is given after a grueling three hour test and is about a subject you have no personal interest in; they already have a better sample of your writing ability in the personal statement; and the committee has a limited amount of time to evaluate applications.

For many years the Writing Sample was administered before the LSAT.

You must attempt the Writing Sample! If you do not, LSAC reserves the right not to score your test.

The LSAT Scoring Scale

Each administered LSAT contains approximately 101 questions, and each LSAT score is based on the total number of questions a test taker correctly answers, a total known as the raw score. After the raw score is determined, a unique Score Conversion Chart is used for each LSAT to convert the raw score into a scaled LSAT score. Since June 1991, the LSAT has utilized a 120 to 180 scoring scale, with 120 being the lowest possible score and 180 being the highest possible score. Notably, this 120 to 180 scale is just a renumbered version of the 200 to 800 scale most test takers are familiar with from the SAT and GMAT. Just drop the "1" and add a "0" to the 120 and 180.

Although the number of questions per test has remained relatively constant over the last eight years, the overall logical difficulty of each test has varied. This is not surprising since the test is made by humans and there is no precise way to completely predetermine logical difficulty. To account for these variances in test "toughness," the test makers adjust the Scoring Conversion Chart for each LSAT in order to make similar LSAT scores from different tests mean the same thing. For example, the LSAT given in June may be logically more difficult than the LSAT given in December, but by making the June LSAT scale "looser" than the December scale, a 160 on each test would represent the same level of performance. This scale adjustment, known as equating, is extremely important to law school admissions offices around the country. Imagine the difficulties that would be posed by unequated tests: admissions officers would have to not only examine individual LSAT scores, but also take into account which LSAT each score came from. This would present an information nightmare.

The LSAT Percentile Table

It is important not to lose sight of what LSAT scaled scores actually represent. The 120 to 180 test scale contains 61 different possible scores. Each score places a student in a certain relative position compared to other test takers. These relative positions are represented through a percentile that correlates to each score. The percentile indicates where the test taker ranks in the overall pool of test takers. For example, a score of 165 represents the 93rd percentile, meaning a student with a score of 165 scored better than 93 percent of the people who have taken the test in the last three years. The percentile is critical since it is a true indicator of your positioning relative to other test takers, and thus law school applicants.

Charting out the entire percentage table yields a rough "bell curve." The number of test takers in the 120s and 170s is very low (only 1.6% of all test takers receive a score in the 170s), and most test takers are bunched in the middle, comprising the "top" of the bell. In fact, approximately 40% of all test takers score between 145 and 155 inclusive, and about 70% of all test takers score between 140 and 160 inclusive.

The median score on the LSAT scale is approximately 151. The median, or middle, score is the score at which approximately 50% of test takers have a lower score and 50% of test takers have a higher score. Typically, to achieve a score of 151, you must answer between 56 and 61 questions correctly from a total of 101 questions. In other words, to achieve a score that is perfectly average, you can miss between 40 and 45 questions. Thus, it is important to remember that you don't have to answer every question correctly in order to receive an excellent LSAT score. There is room for error, and accordingly you should never let any single question occupy an inordinate amount of your time.

Since the LSAT has 61 possible scores, why didn't the test makers change the scale to 0 to 60? Probably for merciful reasons. How would you tell your friends that you scored a 3 on the LSAT? 123 sounds so much better.

There is no penalty for answering incorrectly on the LSAT. Therefore, you should guess on any questions you cannot complete.

The Use of the LSAT

The use of the LSAT in law school admissions is not without controversy. It is largely taken for granted that your LSAT score is one of the most important determinants of the type of school you can attend. At many law schools a multiplier made up of your LSAT score and your undergraduate grade point average is used to help determine the relative standing of applicants, and at some schools a sufficiently high multiplier guarantees your admission.

For all the importance of the LSAT, it is not without flaws. As a standardized test currently given in the paper-and-pencil format, there are a number of skills that the LSAT cannot measure, such as listening skills, note-taking ability, perseverance, etc. LSAC is aware of these limitations and as a matter of course they warn all law schools about overemphasizing LSAT results. Still, since the test ultimately returns a number for each student, it is hard to escape the tendency to rank applicants accordingly. Fortunately, once you get to law school the LSAT is forgotten. For the time being consider the test a temporary hurdle you must leap in order to reach the ultimate goal.

For more information on the LSAT, or to register for the test, contact LSAC at (215) 968-1001 or at their website at www.LSAC.org.

The Analytical Reasoning Section

As you know, the focus of this book is on the Analytical Reasoning section. Each Analytical Reasoning section contains four games and a total of 22-24 questions. Since you have thirty-five minutes to complete the section, you have an average of eight minutes and forty-five seconds to complete each game. Of course, the amount of time you spend on each game will vary with the difficulty and the number of questions per game. For many students, the time constraint is what makes Logic Games the most difficult section on the LSAT, and as we progress through this book, we will discuss time management techniques as well as timesaving techniques that you can employ within the section.

Each logic game contains three separate parts: the scenario, the rules, and the questions.

The Scenario

The game scenario introduces sets of variables—people, places, things, or events—involved in an easy to understand activity such as sitting in seats or singing songs. Here is an example of a game scenario:

> Seven comics—Janet, Khan, Leticia, Ming, Neville, Olivia, and Paul—
> will be scheduled to perform in the finals of a comedy competition.
> During the evening of the competition, each comic, performing alone,
> will give exactly one performance.

In the above scenario there are two variable sets: the comics J, K, L, M, N, O, and P, and the seven performance positions, which would be numbered 1 through 7.

In basic terms, the scenario "sets the table" for the game and provides you with a quick picture of the situation to be analyzed. Although many game scenarios simply introduce the variables, on occasion the test makers place numerical information in the scenario, and this information is critical to understanding the possibilities inherent in the game.

Because you cannot afford to misunderstand any of the basics of the game, you must read the game scenario very closely.

The Rules

The second part of every game is the rules—a set of statements that describe and control the relationships between the variables. Here are the rules that accompany the above game scenario:

> Neville performs either second or sixth.
> Paul performs at some time after Leticia performs.
> Janet performs at some time after Khan performs.
> There is exactly one performance between Neville's
>   performance and Olivia's performance, whether or
>   not Neville performs before Olivia performs.

Each of the initial rules in a game applies to each and every question; however, on occasion a question will explicitly suspend one or more rules for the purposes of that question only. These "suspension" questions always occur at the end of the game.

The third and final part of each logic game is a set of approximately five to eight questions that test your knowledge of the relationships between the variables, the structural features of the game, and the way those relationships and features change as conditions in the game change. More on the questions in a moment.

Approaching the Games

As you begin each game you should carefully and completely read through the entire game scenario and all of the rules *before* you begin writing. This initial reading will help you determine the type of game you are facing, as well as what variable sets exist and what relationships govern their actions. This advice will save you time by allowing you to formulate an exact plan of action, and it will save you from diagramming a rule and then re-diagramming if you find a later rule that alters the situation. At this point in the game you must also fix the rules in your memory. Students who fail to identify strongly with the rules inevitably struggle with the questions. It is also important to identify the most powerful rules in a game and to consider how the rules interact with one another. Of course, we will discuss how to do this throughout our analysis.

In general, these are the initial steps you must take to efficiently move through each game:

1. Read through and fix the rules in your mind.

2. Diagram the scenario and the rules.

3. Make inferences.

4. Use the rules and inferences to attack the questions.

Setups and Diagramming

Your initial reading of the game will also indicate what setup to use to attack the game. Many students are not aware of the best ways to set up logic games, and waste far too much time during the actual exam wondering what approach to take. Because you must read the rules and set up a diagram quickly and efficiently, the key to succeeding on the Logic Games section is to know the ideal approach to every game type before walking into the exam.

You should use the space at the bottom of each game page to diagram your initial setup. This setup should include:

1. A list of the variables and their number. For example: J K L M N O P [7]
2. An identification of any randoms in the game (randoms are variables that do not appear in any rules).
3. A diagrammatic representation of the variable sets.
4. A diagrammatic representation of the rules.
5. A list of inferences. Making inferences involves deducing hidden rules or facts from the given relationships between variables. Inferences almost always follow from a combination of the rules or limiting structural factors within the game.

By following the above list and using the scenario and rules from the previous pages, we can produce the setup on the following page:
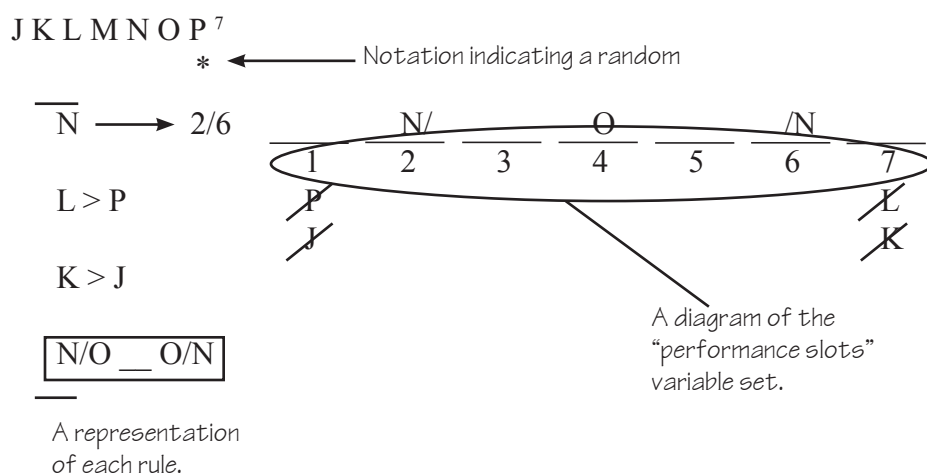
The above setup is linear in nature, and in the next chapter, we will further discuss this type of game, as well as how to create this type of diagram.

Once you have completed your game setup, you should *not* draw or otherwise write on your main diagram again. As you do each question, use the space *next* to the question to reproduce a miniature diagram with the basic structural features of your main diagram. You should *not* use your main diagram for the work of individual questions. For example, if

a question introduces the condition that L sits in the third of seven chairs, draw the seven chair spaces next to the question, place L in the third space, make inferences, and then proceed with the question. Refer to your main setup for the details of the relationship between the variables. There are several important benefits that you receive from working next to the question: First, should you need to return to the question later, your work will be readily available and accessible; second, keeping the individual conditions of each question separate from the main setup reduces the possibility that you will mistake a local condition for a global rule; and third, you will be able to more clearly see which conditions produced which results.

As you complete each question, it is absolutely essential that you *not* erase your previous work. Each question that you complete adds to your repository of game knowledge, and that knowledge can be invaluable when answering other questions. For example, suppose the first question in a game produces a scenario where A is in the first position. Then, the second question asks for a complete and accurate listing of the positions A can occupy. Based on the first question, A can clearly be in the first position, and therefore you can eliminate any answer in the second question which does not contain the first position as a possibility. Thus, the work you do in *some* questions can be used to help answer other questions. This is true as long as the work you are referencing conforms to the conditions in the question you are currently answering. For example, if the third question in the same game states, "If A is in the third position, which of the following can be true?" then you cannot use the information from the first question to help answer the third question because A was in the first position in the first question, and thus does not fit the condition imposed in the third question.

For students who ignore the above recommendations, the results are often quite negative: confusion, disorganization, constant rereading of the rules, and missed questions. Some students say that they save time by using their main diagram for each question. While they may save a short amount of time, the overall costs always outweigh the benefits, particularly since those same students have a tendency to erase during the game. As we proceed with our analysis of the games section, we will revisit this topic from time to time and ultimately prove the efficacy of our recommendations.

The Questions

Once you have completed your diagram and made inferences, you will be ready to answer the questions. Keep in mind that each question has exactly the same value and that there is no penalty for guessing. Thus, if you cannot complete the section you should guess on the questions that remain. If you cannot complete an individual question, do not spend an undue amount of time on the question. Instead, move on and complete the other questions.

Games questions are either global or local. Global questions ask about information derived only from the initial rules, such as "Who can finish first?" or "Which one of the following must be true?" Use the rules and your main diagram to answer global questions. Local questions generally begin with the words "if," "when," or "suppose," and occur when the question imposes a new condition in addition to the initial rules, such as "If Laura sits in the third chair, which one of the following must be true?" The additional conditions imposed by local questions apply to that question only and do not apply to any of the other questions. It is essential that you focus on the implications of the new conditions. Ask yourself how this condition affects the variables and the existing rules. For local questions, reproduce a mini-setup next to the question, apply the local condition, and proceed. We will discuss how to do this in our games discussion in the next chapter.

Within the global/local designation all questions ultimately ask for one of four things: what must be true, what is not necessarily true, what could be true, and what cannot be true. All questions are a variation of one of these four basic ideas, which we will discuss in greater detail in Chapter Two. At all times, you must be aware of the exact nature of the question you are being asked, especially when "except" questions appear. If you find that you are missing questions because you miss words such as "false" or "except" when reading, then take a moment at the beginning of the game to circle the key words in each question, words such as "must," "could," etc.

The key to quickly answering questions is to identify with the rules and inferences in a game. This involves both properly diagramming the rules and simple memorization. If you often find yourself rereading the rules during a game, you are failing to identify with the rules. And do not forget to constantly apply your inferences to each question!

Guessing strategy is discussed in the last chapter of this book.

Local questions almost always require you to produce a "mini-setup" next to the question.

If you frequently misread questions, circle the key part of each question before you begin the game. You will not forget about a word like "except" if you have it underlined!

Attacking the Section

The key to optimal performance on Logic Games is to be focused and organized. This involves a number of factors:

1. Play to your strengths and away from your weaknesses

You are not required to do the games in the order presented on the test, and you should not expect that the test makers will present the games in the best order for you. Students who expect to have difficulty on the games section should attack the games in order of their personal preferences and strengths and weaknesses. You can implement this strategy by quickly previewing each of the four games as you start the section. By doing so you can then select a game that you feel is the best fit for your strengths.

2. Create a strong setup for the game

Often, the key to powerful games performance is to create a good setup. At least 80% of the games on the LSAT are "setup games" wherein the quality of your setup dictates whether or not you are successful in answering the questions. In the following chapters, make sure to focus on the guidelines given for diagramming and inference-making. Mastering those elements will help you become an expert in handling any type of game.

3. Look to make inferences

There are always inferences in a game, and the test makers expect you to make at least a few of them. Always check the rules and your setup with an eye towards finding inferences, and then use those inferences relentlessly to attack the questions.

4. Be smart during the game

If necessary, skip over time consuming questions and return to them later. Remember that it is sometimes advisable to do the questions out of order. For example, if the first question in a game asks you for a complete and accurate list of the positions "C" could occupy, because of time considerations it would be advisable to skip that question and complete the remaining questions. Then you could return to the first question and use the knowledge you gained from the other questions to quickly and easily answer the first question.

Although test takers have found the first game on many LSATs to be the easiest, there is no set order of difficulty, and you cannot predict where the easiest or hardest game will appear. On some tests the first game has been the hardest and the last game has been the easiest. That said, for the majority of LSATs, the hardest game usually appears second or third, and the easiest game usually appears first.

5. Do not be intimidated by size

A lengthy game scenario and a large number of initial rules do not necessarily equal greater difficulty. Some of the longest games are easy because they contain so many restrictions and limitations.

6. Keep an awareness of time

As stated previously, you have approximately eight minutes and forty-five seconds to complete each game and bubble in your answers. Use a timer during the LSAT so you always know how much time remains, and do not let one game or question consume so much time that you suffer later on.

7. Maintain a positive attitude and concentrate

Above all, you must attack each game with a positive and energetic attitude.

The games themselves are often challenging yet fun, and students who actively involve themselves in the games generally perform better overall.

Chapter One QuickReview

Chapter One is a basic overview of the Logic Games section; subsequent chapters will explain and expand on the ideas presented in this chapter.

If you do all four games, you have 8 minutes and 45 seconds to complete each game, inclusive of answer transferring. If you do only three games, you have 11 minutes and 40 seconds to complete each game. If you do just two games, you have 17 minutes and 30 seconds to complete each game.

You can do the games out of order and according to your strengths and weaknesses.

There are three parts to every Logic Game: the scenario, the rules, and the questions.

Always read the scenario and rules once through before you begin diagramming.

Fix the rules in your mind.

Make a main diagram for each game. Include the following:
> List the variables and their exact total number
> Identify randoms
> Diagram the variable sets
> Diagram the rules
> Make inferences
> Identify the powerful rules and variables

Write neatly.

You can do the questions out of order if it saves time or is more efficient.

For local questions, do your work next to the question.

Always look to use your inferences when answering questions.

Do not erase unless you have made a mistake.

Do not forget that work from one question might be useful on other questions.

Maintain a positive attitude, concentrate, and try to enjoy yourself.

CHAPTER TWO: LINEAR GAMES

The Concept of Linearity

Linearity involves the fixed positioning and ordering of variables. In every Linear game, one of the variable sets is chosen as the "base" and is diagrammed in a straight line, either horizontally or vertically, and the remaining variable sets are placed into slots above or next to the base. For example, consider this game scenario:

> A tutor is planning a daily schedule of individual tutoring sessions for each of six students—S, T, W, X, Y, and Z. The tutor will meet with exactly one student at a time, for exactly one hour each session. The tutor will meet with students starting at 1 P. M., for six consecutive hours.

In this game, the hours would be chosen as the base because they have an inherent sense of order (2 P. M. comes immediately after 1 P. M., and immediately before 3 P. M., etc.). The six students would then be placed into individual slots above the six hours, as follows:

$$S\ T\ W\ X\ Y\ Z \longrightarrow \quad \underline{\quad}\quad \underline{\quad}\quad \underline{\quad}\quad \underline{\quad}\quad \underline{\quad}\quad \underline{\quad}$$
$$ 1 \qquad 2 \qquad 3 \qquad 4 \qquad 5 \qquad 6$$

The game could also be set up vertically, and the six students would be placed into individual slots next to the hours:

$$S\ T\ W\ X\ Y\ Z$$
$$\downarrow$$

1 ___
2 ___
3 ___
4 ___
5 ___
6 ___

Variable sets with the greatest sense of inherent order are always chosen as the base because they provide a logical framework within which to place all other variable sets. Certain types of variable sets are always chosen as the base—days of the week, for example. In the above game, if you decide to choose the six students as the base, throughout the questions you will have to keep in mind an extra fact: the order of the hours. Since choosing the days as the base eliminates this problem, it is a superior choice.

Linearity and Grouping are the two core concepts that appear in the Games section. Grouping will be discussed in Chapter Four.

Most of the examples in this chapter will assume the use of a horizontal diagram with six slots like the one to the left.

Always choose a base which has an inherent sense of order.

It is your choice whether to diagram the game horizontally or vertically, although some games demand a vertical setup, such as a game about floors of an office building, and some games demand a horizontal setup, such as a game about houses on a street.

The diagrams above reflect what is known as a one-to-one variable set relationship. In a one-to-one relationship, each variable fills exactly one slot and there are the same number of slots as variables to be placed. For example, there are six hours and six students, and one student will be tutored each hour. Thus, there is one student for each hour, and a total of six students for six hours (a numerical distribution of 1-1-1-1-1-1). The numerical relationship of the variable sets is one of the key indicators of the difficulty of a game, and we will discuss this concept again later in this chapter.

Rule Representation

Your representation of the rules is critical to your success on a game. Many students inefficiently diagram the rules and pay a heavy price when attempting to answer the questions. In representing the rules, there are two primary considerations: how to diagram the rule itself and how to show the implications of the rule on your main diagram. The following section will discuss many of the rule types that commonly appear in Linear games.

Not Laws™

Not Laws physically notate where a variable cannot be placed. For example, if a rule states, "T cannot go first," then this can be represented with a Not Law underneath the first slot:

$$\underset{\displaystyle\not{T}}{\overline{}}_{1} \quad \overline{}_{2} \quad \overline{}_{3} \quad \overline{}_{4} \quad \overline{}_{5} \quad \overline{}_{6}$$
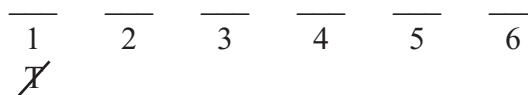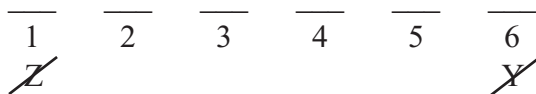
By crossing out (also known as "negating") T under the first slot, you can easily see that T cannot be placed in that slot. Not Laws are very useful since it is essential that you establish the events that cannot be true in a game. In fact, in representing the rules, you should always search for what must be true and what cannot be true. These two characteristics represent the "endpoints" of the spectrum of possibilities within a game, and by defining the endpoints you define the range of possibilities within a game. Additionally, Global questions often appear in order to test your knowledge of what must and what cannot be true, such as "Which one of the following must be true?" (Answer: T cannot be in the first slot). Interestingly, with the above rule, the Not Law is the representation of the rule itself. In many other cases, however, Not Laws will follow after the rule has been separately represented. One such case is with blocks.

Blocks

In Linear games, blocks reflect the idea of a fixed spatial relationship between variables. Blocks represent variables that are next to one another, not next to one another, or separated by a fixed number of spaces. The basic block indicates that two variables are adjoining, as shown by the following rule:

> Y is tutored during the hour immediately before Z is tutored.

This rule should be diagrammed using the block notation $\boxed{\text{Y Z}}$. Furthermore, since Y is always ahead of Z, Z can never be first and therefore an Z Not Law should be placed under the first slot as indicated below. And, since Z is always behind Y, Y can never be last and a Y Not Law should be placed under the last slot (using the example on page 15, it is the sixth slot):
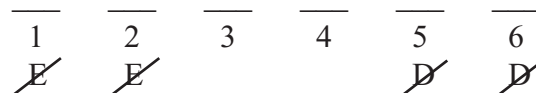
$$\underset{\cancel{Z}}{\underset{1}{\rule{1.5em}{0.4pt}}} \quad \underset{2}{\rule{1.5em}{0.4pt}} \quad \underset{3}{\rule{1.5em}{0.4pt}} \quad \underset{4}{\rule{1.5em}{0.4pt}} \quad \underset{5}{\rule{1.5em}{0.4pt}} \quad \underset{\cancel{Y}}{\underset{6}{\rule{1.5em}{0.4pt}}}$$

Split-Blocks

A split-block indicates that the variables are separated by a fixed number of spaces, as shown by this rule:

> D is inspected two days before E is inspected.

The rule should be diagrammed as $\boxed{\text{D \_\_\_ E}}$ (Even though D is inspected two days before E, that means that there is exactly one day between D and E). As in the previous rule, Not Laws can again be drawn based on the restrictions created by the rule:

$$\underset{\cancel{E}}{\underset{1}{\rule{1.5em}{0.4pt}}} \quad \underset{\cancel{E}}{\underset{2}{\rule{1.5em}{0.4pt}}} \quad \underset{3}{\rule{1.5em}{0.4pt}} \quad \underset{4}{\rule{1.5em}{0.4pt}} \quad \underset{\cancel{D}}{\underset{5}{\rule{1.5em}{0.4pt}}} \quad \underset{\cancel{D}}{\underset{6}{\rule{1.5em}{0.4pt}}}$$

The language used by the test makers to indicate the presence of a split-block can be confusing, and you must pay close attention to wording used. Here are three of the most frequently used language constructions in split-block rules:
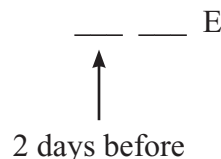
<u>Spaces Ahead or Spaces Before</u>

When the phrase "spaces ahead" or one of its synonyms appears, count the spaces *from* one variable to the other. Consider again the rule from the prior example:

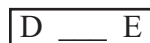D is inspected exactly two days before E is inspected.

The phrase "two days before" indicates the presence of a split-block. In this instance, D is established as being ahead of E, by exactly two days. Starting from E, count forward:

___ E
↑
1 day before

Then:

___ ___ E
↑
2 days before

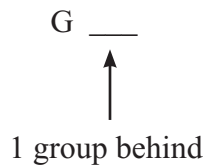Resulting in the final block representation:

| D ___ E |
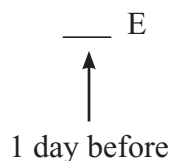
Note that during the test you would not physically draw out each step; we do this simply to illustrate the mental process you would go through.

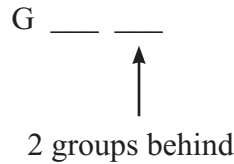<u>Spaces Behind or Spaces After</u>

With this wording, simply reverse the process given above. For example, consider the following rule:

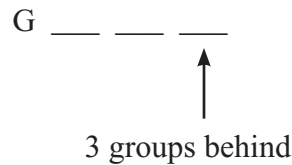F marches exactly three groups behind G.

The phrase "three groups behind" indicates the presence of a split-block. In this instance, F is established as being behind G, by exactly three groups. Starting from G, count backward:
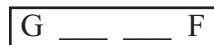
G ___

↑

1 group behind

Then:

G ___ ___

↑

2 groups behind

And finally:

G ___ ___ ___

↑

3 groups behind

Resulting in the final block representation:

| G ___ ___ F |

The diagrams here are presented horizontally, but they could just have easily been presented vertically.
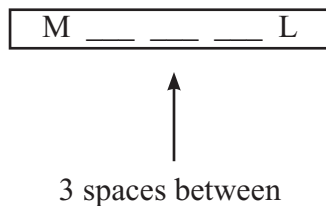
Spaces Between or Spaces Separated By

With the phrase "spaces between" or any synonymous phrase, simply put that exact number of spaces between the two variables. Consider the following rule:

> There are exactly three spaces between L and M, and M is examined before L.

The phrase "three spaces between" indicates the presence of a split-block. In this instance, M is established as being ahead of L, with exactly three examinations between them. Diagram as follows:

| M ___ ___ ___ L |

↑

3 spaces between

Always read carefully—the test makers will place wrong answers that will check to see if you correctly interpreted the wording of a split-block rule (for example, did you see the "between," or did you misinterpret it as "before" or "after"?).

Rotating Blocks

The previous blocks all addressed fixed relationships wherein the order of the variables was known. Rotating blocks present an extra consideration: the order of the variables is not given. For example, consider the following rule:

> S and T are displayed on consecutive days.

This rule establishes two possibilities:

$$\boxed{\text{S T}}$$

and

$$\boxed{\text{T S}}$$

For the sake of absolute clarity, we prefer to write out both possibilities when diagramming this rule, as follows:

$$\boxed{\begin{array}{c}\text{S T}\\\text{T S}\end{array}}$$

We use this representation because during the time pressure of the test it is easy to forget the exact meaning of the rule or get confused if you do not have it diagrammed in an easy-to-read fashion. If you are striving for the fastest rule representation possible, diagram rotating blocks with a circle:

$$\bigcirc\!\!\!\!\text{S T}$$

The circle is meant to convey the idea that the two variables can "go back and forth." Throughout this book, however, we will typically diagram rotating blocks by showing both options in block form in order to reinforce the idea of multiple possibilities.

Rotating Split-blocks

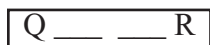Rotating split-blocks can typically be diagrammed in more compact form than regular rotating blocks. Consider the following split-block rule:

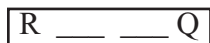> There are two days between the day Q is inspected and the day R is inspected.

In this case, the rule specifies that there must be two days between Q and R, but it does not specify whether Q or R is inspected first. Thus, there are two possible configurations for Q and R:

$$\boxed{\text{Q} \underline{\quad} \underline{\quad} \text{R}}$$

and

$$\boxed{\text{R} \underline{\quad} \underline{\quad} \text{Q}}$$

However, we can diagram this rule in more compact form:

$$\boxed{\text{Q/R} \underline{\quad} \underline{\quad} \text{R/Q}}$$
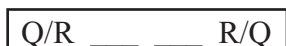
The "/" notation indicates that there are two options for that space of the block. And, it is no mistake that the first option is Q/R and that the second option is R/Q. This notation allows for an efficient representation of both possibilities:

The option represented by the variables before the slash, which is:

$$\boxed{\text{Q} \underline{\quad} \underline{\quad} \text{R}}$$
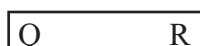
and

The option represented by the variables after the slash, which is:

$$\boxed{\text{R} \underline{\quad} \underline{\quad} \text{Q}}$$

Not-blocks

Not-blocks, or negative blocks, indicate that variables cannot be next to one another, or cannot be separated by a fixed amount of space. Consider the following rule:

Q is not inspected the day before R is inspected.

This rule should be diagrammed with a slash over the block, as in $\boxed{\text{Q/R}}$, which means that Q can never appear in the slot before R. Interestingly, no Not Laws can be drawn from this rule until either Q or R is placed into the setup by another rule or by one of the questions.

Not-blocks can also appear with split-blocks. For example:

D is not inspected exactly two days before E is inspected.
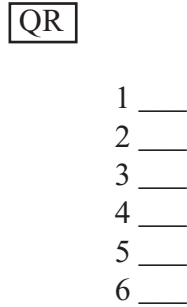
This rule would be diagrammed as:

$$\boxed{\text{D} \underline{\ /\ } \text{E}}$$

Verticality and Horizontality in Blocks

Once you decide to diagram a game horizontally or vertically, make sure your blocks properly reflect the orientation of the setup. As we have seen, in horizontal setups a block such as $\boxed{QR}$ indicates adjacency. But in a vertical setup, a block diagrammed the same way would indicate similarity or overlap, that is, the variables would both be placed in the same slot:

$\boxed{QR}$

1 ___
2 ___
3 ___
4 ___
5 ___
6 ___

In the diagram above, the QR block indicates that Q and R will be inspected on the same day, not adjoining days. To indicate that Q is inspected the day before R in the above diagram, the block should be diagrammed as:

$\boxed{\begin{matrix} Q \\ R \end{matrix}}$

This block is known as a vertical block. Again, Not Laws (R not in 1, Q not in 6) would follow as before.

In a horizontal setup, vertical blocks indicate identicalness or similarity:

$\boxed{\begin{matrix} Q \\ R \end{matrix}}$

___ ___ ___ ___ ___ ___
 1   2   3   4   5   6
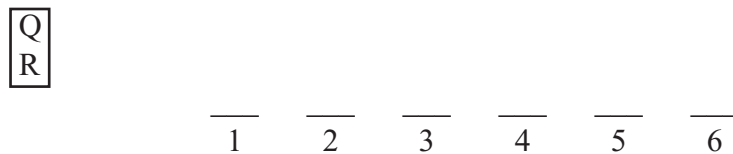
In the diagram above, the QR block indicates that Q and R will be inspected on the same day, not adjoining days. No Not Laws would follow from this block.

In games with vertical setups, vertical blocks indicate adjacency. In games with horizontal setups, vertical blocks indicate similarity or overlap.
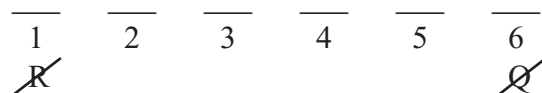
Sequencing Rules

Sequencing rules establish the relative positioning of variables. The key to differentiating a sequencing rule from a block rule is that block rules precisely fix the variables in relationship to each other (for example, one space ahead or two spaces in between) and sequencing rules do not. For example, a rule might state that

> Q is inspected before R is inspected.

To represent sequential relationships, we use ">" or "<" symbols, and thus we can diagram this rule as Q > R.

When we use the ">" symbol, we consider it to be a relative positioning indicator, not an absolute numerical value indicator. Thus, "A > B" indicates that A is to the left of B in a horizontal diagram, no more and no less. Diagramming the relationship as "A < B" would mean the same thing, and thus you can choose which representation you prefer. In this book, however, we will diagram all sequential relationships with a ">" symbol, and in each case we will take that ">" symbol to mean that the variable in front of the sign is to the left of the other variable (if this is confusing to you, simply make your diagrams with the "<" sign).

Returning to the Q > R rule, we only know that Q is inspected before R, but not by how many days. However, since Q is always inspected before R, in a diagram with six variables for six spaces, R can never be inspected first, and because R is always inspected after Q, Q can never be inspected last, and the following Not Laws result:

$$\overline{} \quad \overline{} \quad \overline{} \quad \overline{} \quad \overline{} \quad \overline{}$$

1	2	3	4	5	6
R̸					Q̸

If the rule stated that

> Q is inspected before R is inspected but after H is inspected.

The diagram for the rule would be H > Q > R, and the following Not Laws would result:
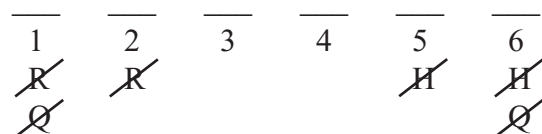
$$\overline{} \quad \overline{} \quad \overline{} \quad \overline{} \quad \overline{} \quad \overline{}$$

1	2	3	4	5	6
R̸	R̸			H̸	H̸
Q̸					Q̸

On occasion, a rule such as the following will appear:

H and Q are both inspected before R is inspected.

This rule should be diagrammed as

```
   H
 - - - - >  R
   Q
```

This representation is known as a Double-branched Sequence. The dotted line before the ">" sign indicates that H and Q do not have a direct relationship with each other. Visually, the dotted line creates two "branches," one above the dotted line involving H, and one below the line involving Q. The line serves as a reminder that the relationship between H and Q is uncertain: H may be inspected before Q, Q may be inspected before H (or, if more than one variable can be placed in a space, that H and Q could be inspected at exactly the same time). The only known relationship is that both H and Q must be inspected before R. From this sequence several Not Laws result in a one-to-one relationship game:

```
 __     __     __     __     __     __
 1      2      3      4      5      6
 R̸      R̸                           H̸
                                    Q̸
```

In the above diagram, R cannot be placed either first or second because there must be room for H and Q, and H and Q cannot be placed sixth since there must be room for R.

The following rule also produces a Branched Sequence:

A is inspected before B, C, and D are inspected.

This Triple-branched Sequence should be diagrammed as:

```
              B
            - - - -
       A  >   C
            - - - -
              D
```
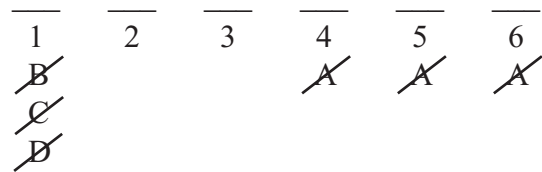
In this representation, the two dotted lines create three separate branches, one for B, one for C, and one for D. Again, we cannot ascertain the exact relationship between B, C, and D other than to say that all three are inspected after A is inspected.

From this sequential rule several Not Laws result in a one-to-one relationship game:

$$\overline{} \quad \overline{} \quad \overline{} \quad \overline{} \quad \overline{} \quad \overline{}$$

1	2	3	4	5	6
B̶			A̶	A̶	A̶
C̶					
D̶					

Although this short section only addresses sequential rules, do not forget that the test makers can combine rules. For example, a block can be combined with sequential rule:

> F is displayed immediately prior to G, and G is displayed at some point before I.

This rule should be diagrammed as:

$$\boxed{F\,G} \; > \; I$$

The following Not Laws would result from the rule:

1	2	3	4	5	6
I̶	I̶			F̶	F̶
G̶					G̶
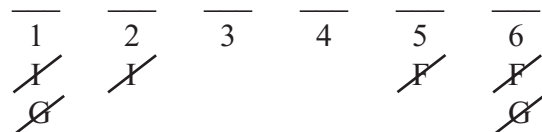
In Chapter Six, we will discuss sequencing rules in more depth.

Dual Options

Certain variables or slots have a limited number of possibilities. When there are only two variables that can occupy a single slot, this can be shown with a Dual Option. Consider the following rule:

Either H or J must be inspected on the third day.

$$\underset{1}{\_\_} \quad \underset{2}{\_\_} \quad \overset{H/J}{\underset{3}{\_\_}} \quad \underset{4}{\_\_} \quad \underset{5}{\_\_} \quad \underset{6}{\_\_}$$

In this case, since it must be true that H or J is inspected on the third day, H/J is placed on the third day. As you can see, what must be true is represented by placing the variables above the slots, and what cannot be true is represented by Not Laws below the numbers:

$$\underset{1}{\_\_} \quad \underset{2}{\_\_} \quad \underset{3}{\_\_} \quad \underset{4}{\_\_} \quad \underset{5}{\_\_} \quad \underset{6}{\_\_}$$

must be true here

cannot be true here (shown as Not Laws)

In the case of the dual-option above, it is also true that no other variable besides H or J can appear third, so it might seem appropriate to show Not Laws on that slot for all other variables. This representation would be correct, but since H and J are already placed on the third day, it is obvious that no other variable can be inspected on that day, and therefore showing Not Laws on the third day would be redundant. However, if you find it helpful to show the Not Laws, by all means do what works best for you.

Split Dual-Options

Occasionally, a single variable will have only two possible positions. This is known as a Split Dual-Option. Consider the following rule:

H must be inspected on the third day or the fifth day.

$$\underset{1}{\_\_} \quad \underset{2}{\_\_} \quad \overset{H/}{\underset{3}{\_\_}} \quad \underset{4}{\_\_} \quad \overset{/H}{\underset{5}{\_\_}} \quad \underset{6}{\_\_}$$

Of course, if H can only be inspected on the third or fifth day, H cannot be inspected on the first, second, fourth, or sixth days. Since the positioning of H is still a bit uncertain, in this case it makes sense to show H Not Laws

on the other days:

$$\begin{array}{cccccc} \underline{} & \underline{} & \overset{\text{H/}}{\underline{}} & \underline{} & \overset{\text{/H}}{\underline{}} & \underline{} \\ 1 & 2 & 3 & 4 & 5 & 6 \\ \cancel{H} & \cancel{H} & & \cancel{H} & & \cancel{H} \end{array}$$

Triple Options

Sometimes a rule or an inference will lead you to determine that a single space can contain only one of three variables. This is known as a Triple Option. Consider the following rule:

A, B, or C must be displayed on the first day.

This rule would be represented directly on the diagram as follows:

$$\begin{array}{cccccc} \overset{\text{A/B/C}}{\underline{}} & \underline{} & \underline{} & \underline{} & \underline{} & \underline{} \\ 1 & 2 & 3 & 4 & 5 & 6 \end{array}$$

Split triple-options can also occur, but they are extremely tricky to work with, and we do not recommend that you use them as part of your rule representation arsenal.