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Manhattan LSAT

Manhattan LSAT Logic Games

LSAT Strategy Guide

Master the LSAT with Tools Developed by Top LSAT Teachers

- Scored in **99th percentile** on the LSAT
- Selected by rigorous **face-to-face auditions**
- Trained **100+ hours** before teaching
- Paid up to **4x the industry standard**

"Far superior. Better diagram setups for Logic Games, simpler and more effective tools in general. The quality of the instruction was several steps above what you see at [other companies]."
- Manhattan LSAT Student

Manhattan LSAT
Logic Games

October 15, 2010

Dear Students,

In your hands is the latest edition of the end result of years of hard work by two of the most talented teachers and curriculum developers that I know. Mike Kim and Dan Gonzalez have combined their skills and pored through years of LSATs to figure out what makes the test tick. One found mastering the LSAT to be nearly effortless. The other had to work hard to unlock the LSAT's inner logic and tendencies, taking him through the experience of moving from a good test-taker to an expert one. Our books and classes represent the best of both worlds: deep and accessible. Doesn't that sound really good?

We pride ourselves on teaching that goes far beyond lecture-style classes. Not only does this mean our students are actively engaged in the material, but also that our teachers are always rethinking how to unlock complex ideas in ways that makes students truly understand. Each new edition of this book incorporates what we've learned from helping our students learn. So, along with thanking our teachers for their invaluable input, I must thank our students for raising their hands to ask and answer interesting questions.

At Manhattan LSAT we're always looking to improve and provide you with the best prep available. While we hope that you'll find that the book you're holding to be exactly what you need, we appreciate any feedback you may have, whether it's positive or not. Please e-mail me at noah@manhattanlsat.com with any comments, and we'll be sure to consider them for future editions.

Good luck as you prepare for the LSAT!

Sincerely,

Noah Teitelbaum
Managing Director
Manhattan LSAT

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Chapter 1
Logic Games Overview

Logic Games on the LSAT

What Are Logic Games?

The Analytical Reasoning section of the LSAT, more commonly called Logic Games, tests your ability to organize individual elements according to a given set of rules. Every logic game is comprised of three parts:

1. The scenario. The scenario introduces the elements, usually people's names or letters representing objects, and provides the context in which the elements are to be organized:

> On Monday, seven trains—F, G, H, J, K, M, and N—leave Rivertown Station consecutively and one at a time. No other trains leave the station on Monday.

2. The constraints. The constraints, or rules, impose limitations on the relationships between and among the elements:

> Train J is the first or the seventh train to leave the station.
>
> Train H leaves the station before M, and exactly two trains leave the station between H and M.
>
> Train N leaves the station either immediately before or immediately after train M.
>
> Train K leaves the station third.

3. The questions. The questions ask you to make inferences based on your understanding of the scenario and the constraints. Each game will have 5 to 7 associated questions. Here's an example:

> If train H leaves the station first, then which one of the following must be true?
>
> (A) Train F leaves the station second.
> (B) Train F leaves the station sixth.
> (C) Train M leaves the station fifth.
> (D) Train N leaves the station fifth.
> (E) Train G leaves the station second.

The correct answer is (D). Later on, we'll discuss the approaches and methods that are best suited for this particular game type. For now, know that you can count on every logic game having a scenario, a set of constraints, and 5–7 associated questions.

The Modern Era of LSAT Logic Games

Logic Games were first introduced on the LSAT in 1982. While this section has not officially been changed since its inception, there are noticeable differences between Logic Games sections administered before 2000 and those administered since. The post-2000, or modern era, Logic Games section differs in the following important ways:

1. Fewer total questions

Exams in the pre-2000 era commonly had 24 Logic Games questions per section. The modern era Logic Games section typically has 22 or 23 questions.

2. Slightly less difficult

On average, modern era games tend to require less involved setups and less advanced inference skills. This is NOT to say that modern era games are easy! Simply keep this point in mind as you practice on a variety of games from before and after the dawn of the modern era.

3. Less variation

Modern era games tend to follow more predictable patterns than those from earlier exams.

This Logic Games Strategy Guide has been developed based on a careful review of exams administered on or after October of 2000. This isn't to say we haven't used representative games from the old era, but the methods and insights presented in this book are grounded in the most up-to-date trends and tendencies of the LSAT Logic Games section.

Logic Games on Your Exam

The LSAT is comprised of the following sections (not necessarily in this order):

SECTION	QUESTIONS	SCORED?	TIME
Logic Games	22–23	yes	35 minutes
Reading Comprehension	26–28	yes	35 minutes
Logical Reasoning (1)	24–26	yes	35 minutes
Logical Reasoning (2)	24–26	yes	35 minutes
EXPERIMENTAL	22–28	no	35 minutes
Essay	1 essay	no	30 minutes

The Experimental section could be Logic Games, Reading Comprehension, or Logical Reasoning. Thus, you may receive two Logic Games sections on your exam. Even if you do, only one of those two sections will actually count towards your final score (unfortunately, it's impossible to know which one as you are taking the exam).

Every Logic Games section has exactly 4 games, each with 5–7 associated questions. In total, the Logic Games section accounts for 22–23 questions of the 99–101 scored questions appearing on any LSAT exam.

Game Types

Three Organizational Schemes

We will spend a good amount of time later on in this book analyzing the specific details of the different game types that you will be responsible for on your exam. For now, it's important to know that almost every logic game will ask you to organize elements in one of the following three ways:

1. Ordering:

Your task is to order a set of individual elements.

F
G
H
J
K
M
N

1 2 3 4 5 6 7

2. Binary Grouping:

Your task is to put elements into one of two distinct groups.

F
G
H
J
K
M
N

Invited to the party Not invited

3. Assignment:

Your task is to assign elements to three or more categories.

F
G
H
J
K
M
N

Dr. Cummings Dr. Desmond Dr. Edwards

Breakdown of Game Types

Within the three organizational schemes outlined above there are a number of specific game types:

GAME TYPE	% of TOTAL	METHOD
ORDERING		
Relative	14%	Tree
Numbered	22%	Number Line
3D Numbered	10%	3D Number Line
BINARY GROUPING		
Open	10%	Logic Chain
Closed	5%	Logic Chain
ASSIGNMENT		
Open	14%	Open Board
Closed	19%	Closed Board
OTHER		
Misc.	7%	

The percentages listed above give an indication of how prevalent each of the game types has been since the October 2000 exam.

Warning!

Later on in this book, we will carefully examine each and every game type, and we will introduce the most efficient and effective methods for tackling each game type. It is worth noting, however, that the data in the table above represent tendencies, NOT absolutes. In other words, not every game will fall neatly into one of these boxes.

One of the keys to Logic Games success is flexibility. If you become a strict "executor" of the recommended strategies and approaches, you will have a harder time mastering the Logic Games section than, say, someone who is able to adapt his or her knowledge, skills, and methodologies to novel situations.

From Here to 170+

The Logic Games Dichotomy

Flexibility is just one of the characteristics that separates the high-scorer from the average test-taker. Let's consider some of the others. When it comes to Logic Games, there is a big difference between the approaches, skills, and attitudes of the average scorer and the top scorer:

MOST LSAT TEST-TAKERS	170+ TEST-TAKERS
Fail to recognize the different game types	Quickly recognize the game types; use this recognition to inform approach
Lack consistent and effective diagramming methods	Develop and maintain consistent diagramming methods
Spend too little or too much time on the setup	Use instincts and experience to help them allocate time wisely
Use trial-and-error as a primary approach	Use key inferences to save time and work
Get confused when a game or constraint strays from the norm	Are able to adapt their methods to work on the "curveball" game or constraint
Struggle to apply the methods and approaches in a real test environment	Practice enough to achieve flexibility and proficiency
Are scared of logic games	Enjoy doing logic games!

Bridging the Gap

So, how do you move from the left column to the right?

Strengthen your game recognition skills

It is important to be able to recognize the common characteristics associated with each game type. Quick game recognition allows you to choose the most effective setup for the game at hand.

Strengthen your setup skills

Once you've recognized the game type, you must be able to diagram the game comfortably and quickly. Your setup/diagram will serve as your main tool for making inferences and answering the questions.

Strengthen your inference skills

Making valid inferences is the key to Logic Games success. Through study and practice, you will begin to see the types of inferences that are common to each of the game types.

Learn to allocate time wisely

Some games require more setup time than others. It's important to get a sense for when it's worth it to spend a bit of extra time on the setup and when it's not.

Learn question-specific approaches

It is important to be able to recognize the common question types and to be proficient in the specific approaches best suited for each.

The next chapter will cover our first game type, Relative Ordering. Let's get to it.

Chapter 2
Relative Ordering & The Tree

Getting Familiar

Timed Trial

Do your best to complete the following game in **8 minutes**. Use whatever approach you see fit.

Exactly eight rock bands—Moonshot, Nonesuch, Orbit, Plethora, Rewind, Simpleton, Truth, and Victim—perform consecutively at a showcase on Friday night. No band performs more than once, and no two bands perform simultaneously. The following conditions apply:

Truth and Plethora both perform at some time before Orbit.
Simpleton performs at some time before Rewind.
Truth performs at some time before Nonesuch.
Victim performs at some time after Simpleton.
Moonshot performs at some time before Victim and at some time after Orbit.

1. Which of the following could be the order of the performances from first to last?

   (A) Plethora, Truth, Orbit, Moonshot, Rewind, Simpleton, Victim, Nonesuch
   (B) Truth, Nonesuch, Moonshot, Plethora, Simpleton, Orbit, Victim, Rewind
   (C) Plethora, Truth, Nonesuch, Orbit, Moonshot, Victim, Simpleton, Rewind
   (D) Truth, Plethora, Nonesuch, Orbit, Simpleton, Moonshot, Victim, Rewind
   (E) Truth, Nonesuch, Orbit, Simpleton, Plethora, Rewind, Moonshot, Victim

2. Which one of the following must be true?

   (A) At least four bands perform at some time after Plethora.
   (B) At least four bands perform at some time after Truth.
   (C) At least two bands perform at some time after Moonshot.
   (D) At least two bands perform at some time before Nonesuch.
   (E) At least two bands perform at some time before Rewind.

3. If Plethora performs fifth, then each of the following could be true EXCEPT:

   (A) Rewind is the sixth band to perform.
   (B) Nonesuch is the fourth band to perform.
   (C) Simpleton is the second band to perform.
   (D) Truth is the third band to perform.
   (E) Rewind performs at some time before Nonesuch but at some time after Truth.

4. If Moonshot performs fourth, then which one of the following must be true?

   (A) Victim is the sixth band to perform.
   (B) Truth performs earlier than Plethora.
   (C) Nonesuch performs earlier than Victim.
   (D) Simpleton performs earlier than Nonesuch.
   (E) Simpleton performs later than Orbit.

5. Each of the following could be true EXCEPT:

   (A) Victim performs earlier than Nonesuch.
   (B) Rewind performs earlier than Truth.
   (C) Nonesuch performs earlier than Plethora.
   (D) Simpleton performs later than Orbit.
   (E) Moonshot performs earlier than Plethora.

6. If the condition that Victim performs at some time after Simpleton is replaced with the condition that Victim performs at some time before Simpleton, and if all other conditions remain in effect, then which of the following must be false?

   (A) Rewind performs last.
   (B) Nonesuch performs last.
   (C) Simpleton performs seventh.
   (D) Victim performs fifth.
   (E) Moonshot performs sixth.

Recognizing Relative Ordering Games

In the modern era of Logic Games, 14% of all games are Relative Ordering games. Moreover, Relative Ordering games seem to be increasing in frequency on more recent exams. Let's first learn how to spot these games, and then we'll discuss the best method for attacking them.

Scenario Cues

Remember that each logic game has three distinct parts: (1) the scenario, (2) the constraints, and (3) the questions. The scenario always provides important information about which of the three main organizational schemes—Ordering, Binary Grouping, or Assignment—you are dealing with. There are a number of words and phrases that commonly appear in the scenario section of Ordering games. Here is a list of the most common Ordering cues, and an example for each:

1. "Order" or "Rank"

> A sales agent makes eight phone calls, one each to exactly eight potential clients—Q, R, S, T, V, W, X, and Y. The **order** of the phones calls depends on the following conditions.
>
> Six employees—Jones, Kilroy, Lee, Moore, Nielson, and Ortiz—are **ranked** from 1 to 6 based on job performance.

2. "Sequentially," "Consecutively," or "In succession"

> Six runners—Mason, Nguyen, Oh, Pearson, Smith, and Riley—race in the 100 meter dash. Each runner runs in exactly one of six lanes numbered **sequentially** 1 through 6.
>
> Seven trucks—F, G, H, J, K, L, and M—arrive at a pick-up station one at a time and **consecutively**.
>
> A mail carrier visits eight homes—Q, R, S, T, V, W, X, and Y—one at a time and **in succession**.

3. "None simultaneously" or "No ties"

> A disc jockey plays seven songs—F, G, H, J, K, L, and M—consecutively on her evening radio program. No two songs are played **simultaneously**.
>
> At the Buford Lake Regatta, six sailboats—Q, R, S, T, V, and W—cross the finish line in succession. No other boats cross the finish line, and there are **no ties**.

4. "Exactly once"

> A film critic sees five movies—*Steer, Triangular, Undone, Victorious*, and *Wail*—one at a time and consecutively. She sees each movie **exactly once**.

Keep in mind that the scenario section of an Ordering game may contain one or more of these cues. While these scenario cues help to define the broad Ordering organizational scheme, it's the language in the constraints that helps us to identify the specific *type* of Ordering game at hand.

Constraint Cues

Relative Ordering games are characterized by constraints that use relative language (as opposed to constraints that use "numbered" language; these types will be discussed in the next chapter) to define limitations on the given elements. Take a look at the following examples:

1. "At some time before" or "At some time after"

Miller arrives **at some time before** Keagan.

Chang interviews **at some time after** Lorens.

S is delivered **at some time after** T but **at some time before** W.

2. "Earlier than" or "Later than"

The television is installed **earlier than** the radio.

Roberts speaks **later than** Murray.

X is presented **later than** Y but **earlier than** Z.

Putting it Together

Let's apply these recognition skills to the "Rock Band" game appearing at the start of the chapter:

> Exactly eight rock bands—Moonshot, Nonesuch, Orbit, Plethora, Rewind, Simpleton, Truth, and Victim—perform **consecutively** at a showcase on Friday night. No band performs more than once, and **no two bands perform simultaneously**. The following conditions apply:
>
> Truth and Plethora both perform **at some time before** Orbit.
> Simpleton performs **at some time before** Rewind.
> Truth performs **at some time before** Nonesuch.
> Victim performs **at some time after** Simpleton.
> Moonshot performs **at some time before** Victim but **at some time after** Orbit.

Notice that in each of the examples above, and in the game above, the constraints give only relative information concerning the position of one element with regard to another. We don't know, for example, how *much* later Victim performs relative to Simpleton. Does Victim perform immediately after Simpleton? Perhaps Victim and Simpleton are separated by two other bands? Maybe three? It is this uncertainty that makes Relative Ordering games difficult to handle. Let's look at this challenge in more detail, and then we'll propose a method for managing the uncertainty.

Setup: The Tree

The Challenges of Relative Ordering

Diagramming Relative Ordering games is difficult because of the uncertainty associated with the distance between elements. Again, while "A comes at some time before B" certainly gives us relative information, we don't know what comes between A and B, if anything. Using our example from before, let's illustrate an *ineffective* way to diagram a Relative Ordering game.

Exactly eight rock bands—Moonshot, Nonesuch, Orbit, Plethora, Rewind, Simpleton, Truth, and Victim—perform consecutively at a showcase on Friday night. No band performs more than once, and no two bands perform simultaneously. The following conditions apply:

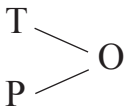
GIVEN CONSTRAINT	UPDATED DIAGRAM	UNCERTAINTY
Truth and Plethora both perform at some time before Orbit.	T O P	Which comes first, T or P?
Simpleton performs at some time before Rewind.	T O P S R	Does S go before T? Does S go before P? Does S go before O? What about R?!
Truth performs at some time before Nonesuch.	T N O P S R	Does N go before or after O Does N go before or after P?
Victim performs at some time after Simpleton.	T N O P S R V	Does V go before or after R?
Moonshot performs at some time before Victim but at some time after Orbit.	T N O M? P S R M? V	What a mess!! I've lost track of what's certain and what's uncertain!

The Tree

We need a method through which we can quickly symbolize the constraints while effectively managing the uncertainty. Let's try this again using the Tree approach:

STEP 1: Start with the first constraint, drawing a line between any two letters for which the relative positioning is known.

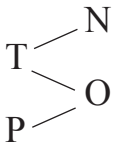
Truth and Plethora both perform at some time before Orbit.
Simpleton performs at some time before Rewind.
Truth performs at some time before Nonesuch.
Victim performs at some time after Simpleton.
Moonshot performs at some time before Victim but at some time after Orbit.



NOTE: We have arbitrarily decided that earlier elements will be placed to the LEFT of later elements. You could easily decide to do it the other way around. It doesn't matter, as long as you are consistent.

STEP 2: Then find the next constraint that can be connected to any part of the existing diagram.

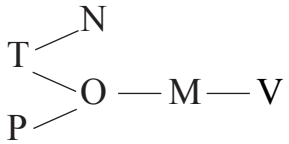
~~Truth and Plethora both perform at some time before Orbit.~~
Simpleton performs at some time before Rewind.
Truth performs at some time before Nonesuch.
Victim performs at some time after Simpleton.
Moonshot performs at some time before Victim but at some time after Orbit.



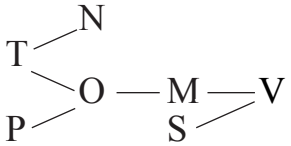
NOTE: Since we're skipping around, we want to keep track of our progress through the constraints by crossing off the ones we've already used.

STEP 3: Repeat until all constraints have been used. Remember to draw lines only between those letters for which the relative position is known.

~~Truth and Plethora both perform at some time before Orbit.~~
Simpleton performs at some time before Rewind.
~~Truth performs at some time before Nonesuch.~~
Victim performs at some time after Simpleton.
Moonshot performs at some time before Victim but at some time after Orbit.

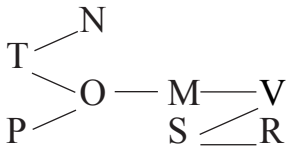


~~Truth and Plethora both perform at some time before Orbit.~~
Simpleton performs at some time before Rewind.
~~Truth performs at some time before Nonesuch.~~
Victim performs at some time after Simpleton.
~~Moonshot performs at some time before Victim but at some time after Orbit.~~



NOTE: It doesn't matter if we draw S pointing up or down from V, as long as it is clearly LEFT of V.

~~Truth and Plethora both perform at some time before Orbit.~~
Simpleton performs at some time before Rewind.
~~Truth performs at some time before Nonesuch.~~
~~Victim performs at some time after Simpleton.~~
~~Moonshot performs at some time before Victim but at some time after Orbit.~~



Different Versions of the Same Relationships

As you draw your own Tree diagrams and compare them with those in this book, you may sometimes note slight orientation differences between your version and the solution. This is okay as long as the horizontal solid line connections between the letters are the same in both diagrams. Here's an example to illustrate:

Diagram 1:

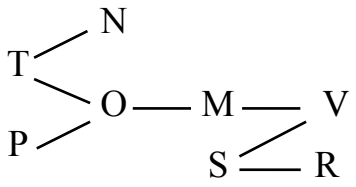
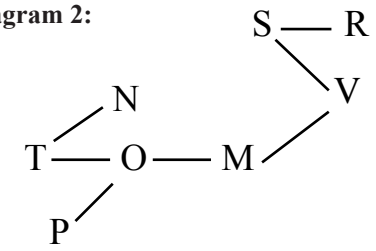


Diagram 2:



Note that Diagram 1 and Diagram 2 look very different at first glance. Don't be fooled; they actually represent the same relationships. In both diagrams, T has exactly two connections: N is after T and O is after T. Similarly, V has exactly two connections in both diagrams: M is before V and S is before V. Upon close examination, you will see that all the connections are exactly the same from one diagram to the other. In short, it is the *horizontal* (from left to right) connections between and among letters that are important, not the vertical (up and down) orientation of the letters. So, when you check the validity of your Tree diagrams, be sure to check these horizontal connections and NOT the overall shape of the picture.

The completed Tree diagram consolidates the information from all the constraints and gives us a clear picture of the relationships between and among the elements. We will unlock the power of the Tree momentarily when we discuss how to draw inferences from the diagram in order to answer questions. First, let's get more comfortable with the setup process by drilling the mechanics.

DRILL IT: Tree Setup Mechanics

Instructions

Each mini-drill will contain one or more constraints. Your task is to construct a Tree diagram for each mini-drill. Be sure to check your diagram against the solution on the next page AFTER EACH AND EVERY PROBLEM. Make sure you understand it before moving on to the next exercise.

Example: O departs at some time before P.

O —— P

1. J leaves at some time before K but after L.

2. Both R and S arrive earlier than Q.

3. K presents earlier than both M and N.
   K presents later than G.

4. X is built later than Y but earlier than Z.
   W is built later than Y.

5. B interviews at some time before F.
   Both D and G interview at some time before B.
   H interviews at some time after D.

6. H and J both speak at some time before N.
   K speaks at some time after P.
   P speaks at some time before H.

7. X plays earlier than W but later than T.
   Y plays later than Z.
   Z plays earlier than X.

8. Both M and H are written later than N.
   J is written earlier than K.
   K is written earlier than N.
   O is written at some time before H but after J.

9. Both T and V call at some time before M.
   N calls at some time after R.
   O calls at some time before N but after M.
   P calls at some time before M.
   T calls at some time before S.

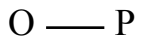
10. M arrives at some time after O.
    L arrives earlier than N
    J arrives a at some time after L but before P.
    S arrives at some time after J.
    N arrives later than O.

11. Both S and Y finish at some time before R.
    T finishes at some time after X.
    S finishes at some time after W but before V.
    X finishes later than S.
    Y finishes later than W.

12. K is produced at some time after N but before O.
    Both L and J are produced at some time before N.
    M is produced at some time after P.
    R is produced at some time before O.
    J is produced at some time before M.

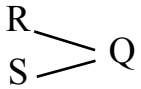
SOLUTIONS: Tree Setup Mechanics

Example: O departs at some time before P.

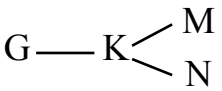


1. J leaves at some time before K but after L.

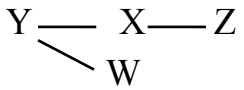
2. Both R and S arrive earlier than Q.



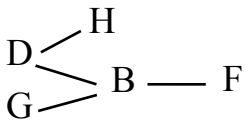
3. K presents earlier than both M and N.
   K presents later than G.



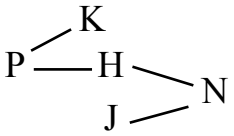
4. X is built later than Y but earlier than Z.
   W is built later than Y.



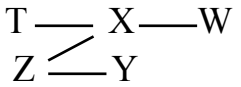
5. B interviews at some time before F.
   Both D and G interview at some time before B.
   H interviews at some time after D.



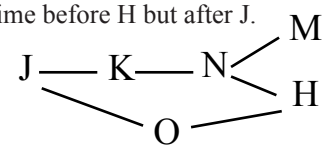
6. H and J both speak at some time before N.
   K speaks at some time after P.
   P speaks at some time before H.



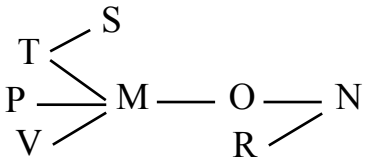
7. X plays earlier than W but later than T.
   Y plays later than Z.
   Z plays earlier than X.



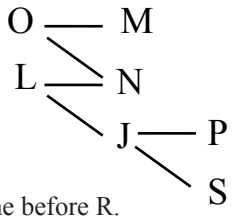
8. Both M and H are written later than N.
   J is written earlier than K.
   K is written earlier than N.
   O is written at some time before H but after J.



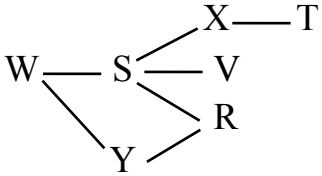
9. Both T and V call at some time before M.
   N calls at some time after R.
   O calls at some time before N but after M.
   P calls at some time before M.
   T calls at some time before S.



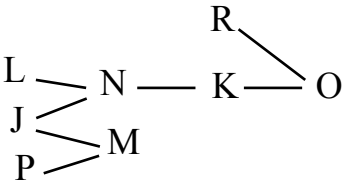
10. M arrives at some time after O.
    L arrives earlier than N
    J arrives at some time after L but before P.
    S arrives at some time after J.
    N arrives later than O.



11. Both S and Y finish at some time before R.
    T finishes at some time after X.
    S finishes at some time after W but before V.
    X finishes later than S.
    Y finishes later than W.



12. K is produced at some time after N but before O.
    Both L and J are produced at some time before N.
    M is produced at some time after P.
    R is produced at some time before O.
    J is produced at some time before M.



Time Allocation

Setup Time vs. Question Time

In Chapter 1, we briefly discussed the importance of wise time allocation. On some games, you will do yourself a favor by spending more time on the setup, while on others you will be better served by moving to the questions sooner:

Front-loaded pacing plan (most extreme case):

SETUP 6 min	QUESTIONS 3 min

Back-loaded pacing plan (most extreme case):

SETUP 1 min	QUESTIONS 8 min

As you were drilling your Tree mechanics, you may have noticed that the Tree setup is not very time intensive (assuming you can execute the mechanics without too much trouble). Generally speaking, the Tree setup should take about 1 minute to complete, leaving you with plenty of time to tackle the questions. The good news is that once you have your completed Tree down on paper, you've basically "solved" the game. Answering the questions becomes an exercise in reading the Tree (as we'll see momentarily).

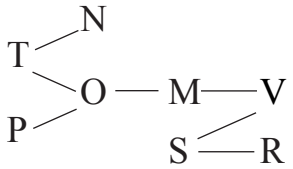
Strategically speaking, you should aim to complete your Tree setup in about 1 minute. You should be finished with the entire game (reading the scenario and constraints, setting up the Tree, and answering all the questions) in about 5–7 minutes, depending on the number of questions. Relative Ordering games represent an opportunity to put time in the bank, or to make up time if you've fallen behind.

These are obviously guidelines and not absolutes. Your own pacing will depend on your comfort level and your skill level. We've discussed and drilled the setup skills; now we'll learn how to read the Tree to make inferences and answer questions.

Inferences: Reading the Tree

Two Rules

By properly setting up your Tree diagram, you are in essence uncovering and relating all of the key inferences required to answer the questions. Your ability to utilize these inferences, however, depends on your ability to correctly read the Tree. There are two important rules that you must keep in mind. We'll discuss these rules one at a time using our completed Tree diagram from our rock band example.



RULE #1: The relative position between two elements, or letters, *can* be determined if you can trace a continuous path between these two elements without changing the horizontal direction of your path.

Example: P to V
Starting at P, we can follow a solid line to the right towards O, continue to the right towards M, and again trace to the right to arrive at V. Note that we have traced a *continuous* path from P to V, and we did not have to change horizontal directions to do so (we moved to the right the entire time). Thus, the position of P relative to V is known. Even though the constraints never referenced a direct relationship between the two, we can infer that P sits somewhere before V (with at least O and M between them).

Example: M to T
From M, we can follow a solid line to the left towards O, then continue on a solid line to the left arriving at T. Thus, we can conclude that T sits somewhere before M.

RULE #2: The relative position between two elements, or letters, *cannot* be determined if the path between the two letters includes one or more changes in horizontal direction.

Example: N to O
From N, we can follow a solid line to the left towards T, but then we must change horizontal directions, moving back to the right to arrive at O. Thus, the position of N relative to O *cannot* be determined. N could come somewhere before O, but it could also come somewhere after O.

Example: P to R
This is a tough one. It *looks* like P comes before R, but the relationship between them is actually unknown. Remember, the Tree is a map of relative position, NOT a physical picture of order. From P, we can follow continuous, solid lines to the right towards V, but then we must change horizontal directions back to the left towards S, and then change again to move right towards R. Thus, the position of P relative to R *cannot* be determined. P could come somewhere before R, but it could also come somewhere after R. Keep in mind that the up and down direction of our traced path is unimportant.

The Key to Tree Success: Reading the "Floaters"

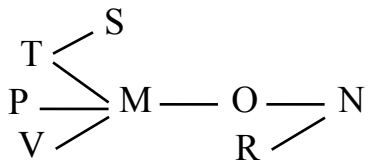
"Floaters" are defined as diagram elements, or letters, that have a known position relative to only one other letter. For example, in our diagram above, N comes somewhere after T, but that's all we know about N. Similarly, R comes somewhere after S, but that's all we know about R. Floaters are the most flexible of the elements because they can fit into the order at just about any position. Getting questions right will depend on your ability to recognize the floaters and manage the uncertainty of their positions. Visually, you can usually spot floaters because they tend to float, or hang, off the diagram like branches, only indirectly connected to the central trunk of the Tree diagram. Let's get some practice applying the rules and reading floaters.

DRILL IT: Reading the Tree

Instructions

Each mini-drill will contain a completed Tree diagram. Your task is to answer the associated questions based on your understanding of the diagram. Be sure to check your answers against the solutions AFTER EACH SET OF QUESTIONS. Make sure you understand before moving on to the next exercise.

Exercise #1:



1. Does V come somewhere before O? Yes, no, or maybe?

2. Does T come somewhere before R? Yes, no, or maybe?

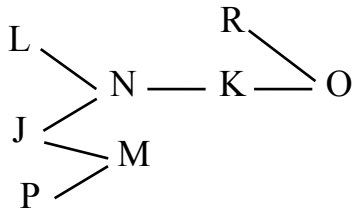
3. How many letters must come after P?

4. Of the eight letters, which ones could occupy the eighth position?

5. Of the eight letters, which ones could occupy the first position?

6. What is the earliest position that O could occupy?

Exercise #2:



1. Does M come somewhere before R? Yes, no, or maybe?

2. Does K come somewhere before J? Yes, no, or maybe?

3. How many letters must come before O?

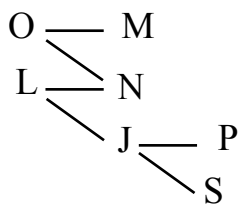
4. Of the eight letters, which ones could occupy the eighth position?

5. Of the eight letters, which ones could occupy the first position?

6. If N occupies the third position, what is the earliest position that M could occupy?

DRILL IT: Reading the Tree (Continued)

Exercise #3:



1. Of the seven letters, which ones could occupy the first position?

2. Of the seven letters, which ones could occupy the last position?

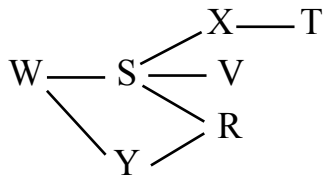
3. How many letters must come before J?

4. How many letters must come after L?

5. What is the latest position that O could occupy?

6. If J occupies the third position, list all of the possible positions that N could occupy.

Exercise #4:



1. What is the earliest position that R could occupy?

2. What is the earliest position that T could occupy?

3. If V occupies the third position, what is the earliest position that R could occupy?

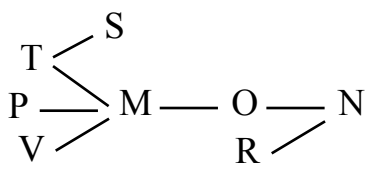
4. What is the latest position that S could occupy?

5. If Y occupies the second position and V occupies the fourth position, how many different possibilities are there for the ordering of the seven letters? Write them out.

6. If T occupies the fourth position, which letters could occupy the seventh position?

SOLUTIONS: Reading the Tree

Exercise #1:



1. Does V come somewhere before O? Yes, no, or maybe? **YES**

We can trace a solid line from V to M to O without changing horizontal directions.

2. Does T come somewhere before R? Yes, no, or maybe? **MAYBE**

From T, we can trace a solid line all the way to N without changing directions, but then we must move back to the left in order to arrive at R. Thus, we *cannot* determine the position of T relative to R. T could come before R or after R.

3. How many letters must come after P? **THREE**

Moving to the right, we can trace a continuous connection between P and M, P and O, and P and N. Thus, M, N, and O must all come after P. Remember, R is a floater! It could potentially come before P.

4. Of the eight letters, which ones could occupy the eighth position? **N, S**

Remember that S is a floater! The only thing we know about S is that it must come after T. Other than that, S is free to occupy any position, including the eighth position.

5. Of the eight letters, which ones could occupy the first position? **T, P, V, R**

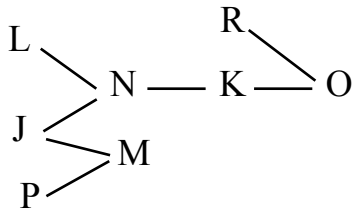
Remember that R is a floater! The only thing we know about R is that it must precede N. Other than that, R is free to occupy any position, including the first position.

6. What is the earliest position that O could occupy? **5TH**

Notice that T, P, V, and M must all come before O. If these four letters must precede O, then the fifth position is the earliest position that O could occupy.

SOLUTIONS: Reading the Tree (Continued)

Exercise #2:



1. Does M come somewhere before R? Yes, no, or maybe? **MAYBE**

Tracing the path from M to R involves changing directions twice. Thus, the position of M relative to R *cannot* be determined. M could come before or after R.

2. Does K come somewhere before J? Yes, no, or maybe? **NO**

From J, we can trace a continuous path to the right to arrive at K. Thus, K comes *after* J, not before.

3. How many letters must come before O? **FIVE**

R, K, N, L, and J can all be traced back to O on a continuous, one-directional path.

4. Of the eight letters, which ones could occupy the eighth position? **O, M**

In this case, M functions somewhat like a floater. We know that M must be preceded by both J and P. Other than that, however, M is free to occupy any position, including the last position.

5. Of the eight letters, which ones could occupy the first position? **L, J, P, R**

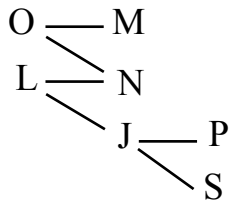
Don't forget about the floater R! We know that R must come before O. Other than that, however, R is free to occupy any position, including the first.

6. If N occupies the third position, what is the earliest position that M could occupy? **5TH**

If N occupies the third position, L and J must occupy the first and second positions (not necessarily in that order). We know that P must come before M. With the first three positions filled, the earliest that P could come is fourth. Thus, the fifth position is the earliest position that M could occupy.

SOLUTIONS: Reading the Tree (Continued)

Exercise #3:



1. Of the seven letters, which ones could occupy the first position? **O, L**

Every other letter has at least one letter that must precede it.

2. Of the seven letters, which ones could occupy the last position? **P, S, M, N**

Watch out for the floater M! Also note that N functions somewhat like a floater in this case. We know that O and L must precede N. Other than that, however, N is free to occupy any position, including the last.

3. How many letters must come before J? **ONE**

L must come before J, and P and S must come after J. J's relationship with O, N, and M is uncertain because we cannot trace a one-directional line between J and O, J and N, or J and M.

4. How many letters must come after L? **FOUR**

N, J, P, and S must all come after L. L's relationship with O and M is uncertain because we cannot trace a one-directional line between L and O or L and M.

5. What is the latest possible position that O could occupy? **5TH**

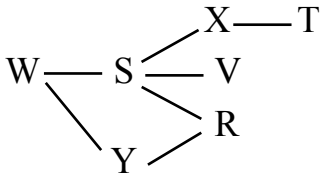
All we know about O is that both M and N must come after it. Thus, O cannot occupy the sixth or seventh positions, but it could occupy the fifth position.

6. If J occupies the third position, list all of the possible positions that N could occupy. **4TH, 5TH 6TH, 7TH**

If J occupies the third position, L and O must occupy the first and second positions (not necessarily in that order). This leaves the fourth, fifth, sixth, and seventh positions for M, N, P, and S. Since there is no one-directional connection between any of these four letters, their relative positioning is uncertain. Thus, N could occupy any one of the last four positions.

SOLUTIONS: Reading the Tree (Continued)

Exercise #4:



1. What is the earliest position that R could occupy? **4TH**

S, Y, and W must all come before R.

2. What is the earliest position that T could occupy? **4TH**

X, S, and W must all come before T.

3. If V occupies the third position, what is the earliest position that R could occupy? **5TH**

If V occupies the third position, W and S must occupy the first and second positions, respectively. Y must come before R. With the first three positions filled, the fourth position is the earliest that Y could occupy. R could occupy the fifth position immediately after Y.

4. What is the latest possible position that S could occupy? **3RD**

X, T, V, and R must all come after S. Thus, the latest position that S could occupy is the third.

5. If Y occupies the second position and V occupies the fourth position, how many different possibilities are there for the ordering of the seven letters? Write them out.

W Y S V R X T
W Y S V X R T
W Y S V X T R

If Y occupies the second position and V occupies the fourth position, S must occupy the third position.

6. If T occupies the fourth position, which letters could occupy the seventh position? **V, R**

If T occupies the fourth position, W, S, and X must occupy the first, second and third positions, respectively. This leaves V, R, and Y for the last three positions. Y must come before R, so Y can't occupy the last position.

Applying the Tree

Try It Again

Now that you've learned how to draw inferences from the Tree diagram, it's time to put your skills to good use. Let's revisit the rock band game introduced at the start of the chapter. Try developing your Tree from scratch, and then use it to tackle the questions. Again, limit yourself to **8 minutes**. We'll work through the solutions together on the pages to come.

Exactly eight rock bands—Moonshot, Nonesuch, Orbit, Plethora, Rewind, Simpleton, Truth, and Victim—perform consecutively at a showcase on Friday night. No band performs more than once, and no two bands perform simultaneously. The following conditions apply:

Truth and Plethora both perform at some time before Orbit.
Simpleton performs at some time before Rewind.
Truth performs at some time before Nonesuch.
Victim performs at some time after Simpleton.
Moonshot performs at some time before Victim and at some time after Orbit.

1. Which of the following could be the order of the performances from first to last?

   (A) Plethora, Truth, Orbit, Moonshot, Rewind, Simpleton, Victim, Nonesuch
   (B) Truth, Nonesuch, Moonshot, Plethora, Simpleton, Orbit, Victim, Rewind
   (C) Plethora, Truth, Nonesuch, Orbit, Moonshot, Victim, Simpleton, Rewind
   (D) Truth, Plethora, Nonesuch, Orbit, Simpleton, Moonshot, Victim, Rewind
   (E) Truth, Nonesuch, Orbit, Simpleton, Plethora, Rewind, Moonshot, Victim

2. Which one of the following must be true?

   (A) At least four bands perform at some time after Plethora.
   (B) At least four bands perform at some time after Truth.
   (C) At least two bands perform at some time after Moonshot.
   (D) At least two bands perform at some time before Nonesuch.
   (E) At least two bands perform at some time before Rewind.

3. If Plethora performs fifth, then each of the following could be true EXCEPT:

   (A) Rewind is the sixth band to perform.
   (B) Nonesuch is the fourth band to perform.
   (C) Simpleton is the second band to perform.
   (D) Truth is the third band to perform.
   (E) Rewind performs at some time before Nonesuch but at some time after Truth.

4. If Moonshot performs fourth, then which one of the following must be true?

   (A) Victim is the sixth band to perform.
   (B) Truth performs earlier than Plethora.
   (C) Nonesuch performs earlier than Victim.
   (D) Simpleton performs earlier than Nonesuch.
   (E) Simpleton performs later than Orbit.

5. Each of the following could be true EXCEPT:

   (A) Victim performs earlier than Nonesuch.
   (B) Rewind performs earlier than Truth.
   (C) Nonesuch performs earlier than Plethora.
   (D) Simpleton performs later than Orbit.
   (E) Moonshot performs earlier than Plethora.

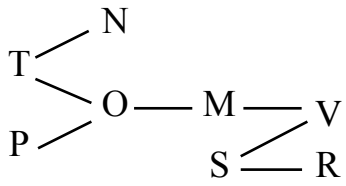
6. If the condition that Victim performs at some time after Simpleton is replaced with the condition that Victim performs at some time before Simpleton, and if all other conditions remain in effect, then which of the following must be false? :

   (A) Rewind performs last.
   (B) Nonesuch performs last.
   (C) Simpleton performs seventh.
   (D) Victim performs fifth.
   (E) Moonshot performs sixth.

How Did You Do?

Check your work against the following explanations. **Read through the ENTIRE explanation for each question, even if you got the question correct**. We've included many general tips and takeaways that you may find useful.

1. Which of the following could be the order of the performances from first to last?
   (A) Plethora, Truth, Orbit, Moonshot, Rewind, Simpleton, Victim, Nonesuch
   (B) Truth, Nonesuch, Moonshot, Plethora, Simpleton, Orbit, Victim, Rewind
   (C) Plethora, Truth, Nonesuch, Orbit, Moonshot, Victim, Simpleton, Rewind
   (D) Truth, Plethora, Nonesuch, Orbit, Simpleton, Moonshot, Victim, Rewind
   (E) Truth, Nonesuch, Orbit, Simpleton, Plethora, Rewind, Moonshot, Victim



The correct answer is (D).

Most Logic Games sets start with a question like this one, an Orientation question. These questions ask you to choose one possible *complete* outcome from five choices. If our Tree is right, the String Technique is the easiest approach:

Looking at our Tree, we see a P-O-M-V string. These four letters must come in that order (not necessarily consecutively, but certainly in that order). So, let's start by eliminating any answer choices that do NOT contain the P-O-M-V string. (B) has M-P-O-V. Eliminate it. (E) has O-P-M-V. Eliminate it. Now let's take another string: S-V. Let's eliminate any choice that does NOT contain the S-V string. Eliminate (C). Lastly, we'll evaluate the S-R string. Eliminate (A). We're left with (D).

We could also use the actual text versions of the constraints in a systematic manner to eliminate incorrect answers:

First constraint: Truth and Plethora both perform before Orbit.
Examine each answer choice, beginning with (A), and look for any violations of this constraint. The ordering in answer choice (E) does not comply with this constraint. Eliminate (E).

Second constraint: Simpleton performs before Rewind.
Start with answer choice (A) once again, and look for violations of this constraint. The ordering in answer choice (A) does not comply with this constraint. Eliminate (A). On Orientation questions, a given constraint will rarely eliminate more than one answer choice. Knowing this, we should immediately move on to the next constraint.

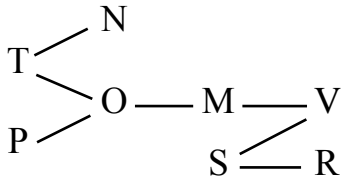
Third constraint: Truth performs before Nonesuch.
Since we've already eliminated both (A) and (E), we'll start with answer (B). Examine the answer choices and look for violations. This particular constraint doesn't allow us to make any eliminations.

Fourth constraint: Victim performs after Simpleton.
(C) does not comply with this constraint. Eliminate (C). Again, we'll move on immediately since the likelihood of eliminating a second answer with this constraint is low.

Fifth constraint: Moonshot performs before Victim but after Orbit.
Examine the remaining choices, (B) and (D), and look for violations. The ordering in answer choice (B) does not comply. Eliminate (B). You may be tempted to verify answer (D), but this will only waste valuable time. If you've confidently eliminated the other four choices, (D) must be correct. Trust yourself and move on!

2. Which one of the following must be true?

   (A) At least four bands perform at some time after Plethora.
   (B) At least four bands perform at some time after Truth.
   (C) At least two bands perform at some time after Moonshot.
   (D) At least two bands perform at some time before Nonesuch.
   (E) At least two bands perform at some time before Rewind.



The correct answer is (B).

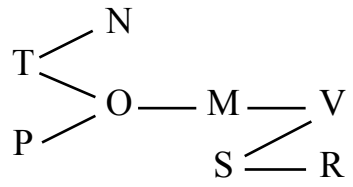
Starting with (A), let's analyze the choices using our Tree diagram. Our diagram shows that O, M, and V must perform at some time after P (we can trace continuous, one-directional paths from P to O, P to M, and P to V), but that's all we know about P. We can't be sure that there are at least four bands after P. Eliminate (A).

Analyzing answer choice (B), we see that indeed N, O, M, and V must all come at some time after T (we can trace continuous, one-directional paths from T to N, T to O, T to M, and T to V). Thus, the correct answer must be (B). During the actual exam, you may be tempted to analyze the remaining answer choices to be sure they're wrong, but that would be a waste of valuable time. Only one answer can be correct. If you're confident in your Tree setup, and if you're confident in the inferences you've made, choose (B) and move on to the next question!

That said, you *should* take the time to analyze each and every answer choice as you are reviewing your practice work. As an example, take a few minutes now to analyze (C), (D), and (E). Can you see why these need not be true? Use the Tree to convince yourself, and even write out a few possibilities if you're unsure.

This in-depth analysis will sharpen your instincts and build your confidence. Do the hard work of verifying now so that you'll have the confidence to choose (B) and move on during the exam.

3. If Plethora performs fifth, then each of the following could be true EXCEPT:
   (A) Rewind is the sixth band to perform.
   (B) Nonesuch is the fourth band to perform.
   (C) Simpleton is the second band to perform.
   (D) Truth is the third band to perform.
   (E) Rewind performs at some time before Nonesuch but at some time after Truth.



				P	O	M	V
1	2	3	4	5	6	7	8

The correct answer is (A).
This is an "If" question. "If" questions introduce an additional constraint that is to be applied *only* for this question. In this case, the additional constraint is that P performs fifth. Next to the question, we set up an "If" diagram that incorporates this additional information (we don't want to write over our original Tree because we'll need the original form for future questions). From our Tree, we can quickly see that O, M, and V must all come at some time after P, and in that order. So, O, M, and V must perform sixth, seventh, and eighth, respectively.

Note the word EXCEPT in the question, printed in all caps. This must be important! You will see four kinds of EXCEPT questions on the Logic Games section. It is crucial that you understand exactly what you are being asked for in these situations. Here's a quick translation guide:

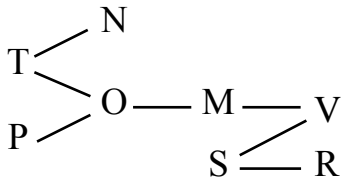
EXCEPT wording	Translation
...each of the following could be true EXCEPT:	Which one must be false?
...each of the following must be true EXCEPT:	Which one could be false?
...each of the following could be false EXCEPT:	Which one must be true?
...each of the following must be false EXCEPT:	Which one could be true?

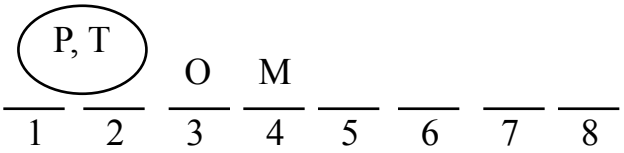
Notice that the translation always involves changing "could" to "must" and "must" to "could." Also notice that "true" goes to "false" and "false" goes to "true."

For these tricky questions, it is very important that you anticipate (before you start analyzing the choices) the nature of the five choices. For this particular question, we translate to "Which one must be false?" Thus, four choices could be true and one must be false. Get that straight before anything else!

We start with choice (A) and we can immediately see from our "If" diagram that R cannot possibly perform sixth. No need to check the remaining answers; move on! For the purposes of your review, however, this is a good time to verify that the remaining answer choices could indeed be true.

4. If Moonshot performs fourth, then which one of the following must be true?
   (A) Victim is the sixth band to perform.
   (B) Truth performs earlier than Plethora.
   (C) Nonesuch performs earlier than Victim.
   (D) Simpleton performs earlier than Nonesuch.
   (E) Simpleton performs later than Orbit.





The correct answer is (E).
The additional constraint in this "If" question is that M performs fourth. Our "If" diagram incorporates this new information. The Tree clearly shows that O, T, and P must all come at some time before M, with T and P preceding O. Thus, O must be third. Notice that the order of T and P is unknown. We'll use a circle to symbolize this uncertainty. While we don't know exactly who performs first, T or P, we do know that the first four spaces are occupied. This leaves the remaining four spaces for N, S, V, and R, not necessarily in that order.

In a situation like this, the incorrect choices will usually attempt to define the relationships for elements that have uncertain relative positions. For example, we don't know which comes first, P or T. We can expect an answer or two that will attempt to order these two bands. Also, the last four slots will be filled by N, S, V, and R, but their relative positioning is uncertain (aside from the fact that V and R must come after S). Be wary of answers that attempt to provide some fixed order in the last four positions.

Answer choice (A) is a good example. Again, we don't know the ordering of the last four elements. After all, N and R are floaters. Eliminate (A).

Answer choice (B) attempts to define the relationship between P and T. All we know about P and T is that they must come at some time before O. Which comes first is anybody's guess at this point. Eliminate (B).

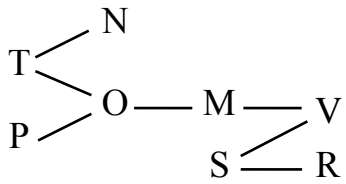
In (C), we again see an attempt to define the position of a floater. N could potentially occupy any one of the last four slots. Eliminate (C).

Same thing in answer choice (D). The position of the floater N relative to S is unknown. Eliminate (D).

We see that answer choice (E) must be correct. If you're confident in your work up to this point, you can move on without verifying. A quick check proves easy enough, however, and we see that S must indeed perform later than O, since all the spots before O are filled.

Are you thinking that you could have done without the "If" diagram? As you get more practice reading the Tree, you'll find yourself "moving" the parts of the Tree in your mind as you answer questions like these. You'll be able to check the answer choices against the Tree without actually needing to draw out the "If" diagram. In this case, a quick examination of the Tree tells us that the first four spots will be filled by T, P, O, and M, making it impossible for S to come anywhere before O. If you're not there yet, don't worry. Keep working on it!

5. Each of the following could be true EXCEPT:
   (A) Victim performs earlier than Nonesuch.
   (B) Rewind performs earlier than Truth.
   (C) Nonesuch performs earlier than Plethora.
   (D) Simpleton performs later than Orbit.
   (E) Moonshot performs earlier than Plethora.



The correct answer is (E).

We quickly note the EXCEPT language (it's hard to miss!) and translate to: "Which one must be false?" Again, before we do anything else, let's anticipate the nature of the choices: four could be true, one must be false.

Answer choice (A) attempts to define the relative positions of N, a floater, and V. Remember, N could go anywhere, except before T! Thus, V could certainly perform earlier than N. Eliminate (A).

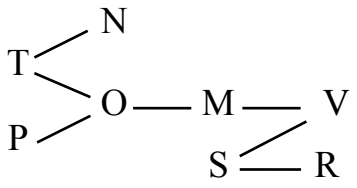
Answer (B) tries the same trick. The floater R can go anywhere except before S! Thus, R could certainly perform earlier than T. Eliminate (B).

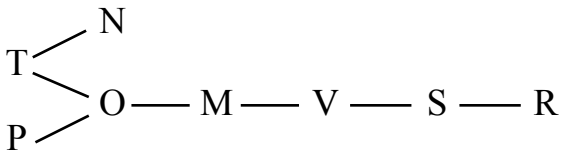
The floater N could certainly perform earlier than P. Eliminate (C).

The position of S relative to O is unknown, so S could potentially perform later than O. Eliminate (D).

Answer (E) is the correct answer. We see from the diagram that M must always come somewhere after P. Thus, the statement that Moonshot performs earlier than Plethora must be false.

6. If the condition that Victim performs at some time after Simpleton is replaced with the condition that Victim performs at some time before Simpleton, and if all other conditions remain in effect, then which of the following must be false?
   (A) Rewind performs last.
   (B) Nonesuch performs last.
   (C) Simpleton performs seventh.
   (D) Victim performs fifth.
   (E) Moonshot performs sixth.





The correct answer is (E).
This is a unique type of "If" question in that instead of introducing an additional constraint it actually alters one of the existing constraints. These questions are rare, but if you encounter a question such as this on an LSAT game it will most likely be the last question in the set. These are difficult questions that are designed to be time-intensive. Generally, they require that we create a new diagram, in this case a new Tree, that incorporates the altered constraint. As we do for all "If" questions, we'll draw a new diagram next to the question text in our test booklet.

Let's anticipate the nature of the choices: four could be true, one must be false.

We can see from our new Tree that R could indeed perform last. Eliminate (A).

As we analyze (B), we must keep in mind that the floater N can go just about anywhere (except before T), including *after* R. N could potentially perform last. Eliminate (B).

S performs seventh whenever the floater N performs somewhere before S. Eliminate (C).

V performs fifth whenever the floater N performs somewhere after V. Eliminate (D).

M must be followed by at least three bands, V, S, and R (and potentially a fourth, N). Thus, the latest M could perform is fifth. The statement that Moonshot performs sixth must be false.

Question-Specific Approaches

What Did We Learn?

Let's summarize the main takeaways from the preceding six questions. You will find that many of these takeaways cut across all game types. We will be revisiting many of these concepts and approaches as we uncover the details of the remaining game types.

1. On Orientation questions, apply the constraints, one at a time, to the answer choices. Eliminate answers that violate the given constraint, and then move on to the next constraint. On Tree games, use the String approach to tackle these questions.

2. On Orientation questions, it is rare that any one constraint will eliminate more than one answer choice. Therefore, once you find an answer that violates a particular constraint, eliminate it and immediately move on to the next constraint.

3. As soon as you find a correct answer, choose it and move on! Don't bother with proving the others to be incorrect. There can only be one correct answer.

4. As you are *reviewing* your work after completing a game for practice, do take the time to verify all correct answers and disprove all incorrect answers. This will sharpen your instincts and build your confidence.

5. "If" questions add a new constraint. If you need to create a new diagram or abbreviated sketch, do it next to the text in your test booklet. DO NOT write over the original diagram!

6. Be comfortable interpreting questions with "EXCEPT" language:

EXCEPT wording	Translation
...each of the following could be true EXCEPT:	Which one must be false?
...each of the following must be true EXCEPT:	Which one could be false?
...each of the following could be false EXCEPT:	Which one must be true?
...each of the following must be false EXCEPT:	Which one could be true?

7. On tricky EXCEPT questions, anticipate the nature of the choices before you start (for example, four could be true, one must be false).

8. As you become more comfortable with the Tree, you'll be able to "move" the elements of the Tree in your mind as you consider the question at hand. This is something to shoot for as it will save you time.

9. Always watch out for the floaters! The floaters will come into play on just about every question.

Putting it All Together

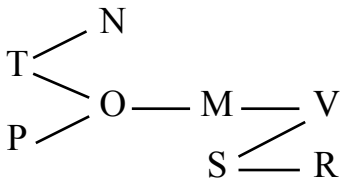
Here's your chance to put all the pieces together on a new game. Give yourself **8 minutes** to complete the following game. We'll work through the setup and solutions together on the pages to come.

[For copyright reasons, this question set and all associated explanations have been removed from this downoadable sample document.]

In Conclusion

Advantages of the Tree

You've learned to recognize Relative Ordering games, set up the Tree, allocate your time wisely on Relative Ordering games, draw inferences from the Tree diagram, and apply question-specific approaches while attacking the problems. A few advantages of the Tree system:



1. It is a repeatable process. The process of diagramming the branches of the Tree is easy to understand, easy to practice, and perhaps most important, easy to execute under the pressure of the real exam.

2. It uncovers implicit relationships. By strictly diagramming the *explicit* relationships given in the constraints, we automatically arrive at relationships that are *implicit* in the rules given. For example, in the Tree above we can easily see that V comes after P, even though that particular relationship was never explicitly mentioned in the constraints.

3. It effectively manages the uncertainty. There will always be some uncertainty in Relative Ordering games. The key is managing the uncertainty so that you know exactly where it exists (mostly in the floaters!). For example, the only thing we know about N is that it comes somewhere after T. The position of N relative to the other elements is uncertain. By using the Tree to recognize floaters, we can effectively manage the uncertainty of their position. The key is being certain about the uncertainty!