A Comprehensive System for Attacking the Logic Games Section of the LSAT

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The Ultimate Guide for Logic Games

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This file contains two short excerpts from the *LSAT Logic Games Bible*, and is designed to briefly illustrate PowerScore’s methods and writing style.
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Making Inferences

Inferences are relationships that must be true in a game but are not explicitly stated by the rules or game scenario. One of the keys to powerful games performance is making inferences after you have diagrammed all of the rules. In some games, a single inference can be the difference between the game seeming easy or difficult. For some people inference making is intuitive, and for others it is very difficult. Here are three basic but time-tested strategies for making inferences:

1. Linkage

Linkage is the simplest and most basic way to make inferences. Linkage involves finding a variable that appears in at least two rules and then combining those two rules. Often that combination will produce an inference of value. Consider the following two rules:

- K must be played before L.
- L must be played before M.

Individually the two rules would be diagrammed as follows:

\[
\begin{align*}
K & > L \\
L & > M
\end{align*}
\]

If we represented Not Laws from each rule, we would have the following:

Clearly, “L” is common to both rules. By combining the rules we come up with the following relationship:

\[
K > L > M
\]

We can now infer that K must be played before M, and this information helps us to establish all of the applicable Not Laws:

Linkage between the rules should always be the first place you look to discover inferences. Incidentally, the above example again proves the
value of reading all of the rules before you begin diagramming. If you had diagrammed each rule individually, then later discovered the linkage, you would then have had to return to the two rules and diagram the additional implications of the linkage. That would be an inefficient approach and thus detract from your performance.

Here is another example featuring linkage:

If Q is displayed fourth, then R must be displayed first. R and S are displayed consecutively.

Individually the two rules would be diagrammed as follows:

\[ \begin{align*}
\text{Q4} & \rightarrow \text{R1} \\
\text{R} & \rightarrow \text{S} \\
\text{S} & \rightarrow \text{R}
\end{align*} \]

However, if R is first, then according to the second rule S must be second, which should be written as:

\[ \text{Q4} \rightarrow \text{R1, S2} \]

Thus, combining the two rules leads to the further inference that S must be second when Q is fourth. Although this cannot be represented directly on the diagram, this relationship can and should be displayed as above, as an addition to the original representation of the first rule.

Here is a final example featuring linkage:

W and X cannot speak consecutively. X must speak third or fifth.

Individually the two rules would be diagrammed as follows:

\[ \begin{align*}
\text{W} & \rightarrow \text{X} \\
\text{X} & \rightarrow \text{W} \\
\text{X} & \rightarrow \text{W}
\end{align*} \]

At first, it may appear that linking the two rules yields no inference, but if X is always third or fifth, then W can never be placed fourth (to do so would cause a violation regardless of whether X was third or fifth). This leads to a W Not Law on 4:

\[ \begin{align*}
1 & \\
2 & \\
3 & \\
4 & \\
5 & \\
6 &
\end{align*} \]
2. Rule Combinations

As we study more and more game types, your arsenal of rule recognition skills will increase. In certain games, there are classic combinations which always yield certain inferences. In contrast to linkage, however, making inferences from rule combinations does not rely upon the connection of a variable common to two or more rules. For example, consider this scenario:

Six lawyers—H, J, K, L, M, and O—must speak at a convention. The six speeches are delivered one at a time, consecutively, according to the following restrictions:

- K and L must speak consecutively.
- O must speak fifth.

From the scenario and rules above, we can draw the following diagram:

Because of the interaction of the two rules, we can infer that K and L can never speak sixth (there is not enough room for K and L to be next to each other). In addition, because O must speak fifth, only H, J, and M remain as possible candidates to speak sixth. This could be shown as a triple-option (H/J/M):

This type of rule combination is one of many we will discuss in this book.
3. Restrictions

In Logic Games always look to the restricted points for inferences. Restricted points are the areas in the game where only a few options exist—for example, a limited number of variables to fill in a slot, a block with a limited number of placement options, or a slot with a large number of Not Laws. If you can identify a restriction, generally there are inferences that will follow from your examination of that point. The trick is to determine exactly where the restrictions in a game actually occur.

Consider the following example:

A salesman must visit five families—the Browns, the Chans, the Duartes, the Egohs, and the Feinsteins—one after another, not necessarily in that order. The visits must conform to the following restrictions:
- The Browns must be visited first or fifth.
- The Feinsteins cannot be visited third.
- The Chans must be visited fourth.

Using the scenario and rules above, we can produce the following diagram:

\[
\begin{array}{cccccc}
B & C & D & E & F \\
1 & 2 & 3 & 4 & 5 \\
\end{array}
\]

\[
\begin{array}{cccccc}
\text{B/} & \text{D/E} & \text{C} & \text{/B} \\
1 & 2 & 3 & 4 & 5 \\
\end{array}
\]

The easiest way to find restrictions in a game is to examine the Not Laws for each slot. The slot with the most Not Laws may be so restricted that it has a limited number of possibilities. In this case, the third slot is the most restricted active slot since it has two Not Laws. Technically, the fourth slot is the most restricted since it has only one option, the Chans. But, since the fourth slot has already been filled by the Chans, it is no longer “active” and we can disregard it from further consideration. However, since the Chans have been placed, they cannot go in any other slot, and so it is now true that neither B, C, nor F can be visited third. Since there are only five families to visit and B, C, and F have been eliminated from contention, it follows that either D or E must be visited third. That inference should be shown with a D/E dual-option on the third slot:

\[
\begin{array}{cccccc}
B & C & D & E & F \\
1 & 2 & 3 & 4 & 5 \\
\end{array}
\]

\[
\begin{array}{cccccc}
\text{B/} & \text{D/E} & \text{C} & \text{/B} \\
1 & 2 & 3 & 4 & 5 \\
\end{array}
\]
Restrictions also frequently occur with blocks, especially split-blocks. Consider the following scenario:

A child must play five games—P, Q, R, S, and T—one after another, not necessarily in that order. The games must be played according to the following conditions:

- The child plays exactly two games between playing S and playing T, whether or not S is played before T.
- P is played immediately before Q is played.

Once again, using the scenario and rules, we can produce the following initial setup:

\[
\begin{array}{cccc}
P & Q & R & S \quad T^5 \\
\hline
S/T & \_ & \_ & T/S \\
P & Q & \_ & Q & T/S \\
\end{array}
\]

As usual, P cannot be played fifth since Q must be played behind it, and Q cannot be played first since P must always be played ahead of it. However, the S and T split-block is more interesting because it has a limited number of spacing options. In fact, the ST split-block can only be placed into positions 1-4 or 2-5. Thus, neither S nor T can be played third. At this point it appears that we have our inferences and that we are ready to continue on. But consider the interaction of the two blocks. If S and T are in the 1-4 position, then P and Q must be in 2-3. If S and T are in the 2-5 position, then P and Q must be in the 3-4 position. That means that either P or Q must always be played third. Additionally, we can infer that R must always be played first or fifth:

\[
\begin{array}{cccc}
P & Q & R & S \quad T^5 \\
\hline
S/T & \_ & \_ & T/S \\
P & Q & \_ & Q & T/S \\
\end{array}
\]

Given these inferences, there are only two possible “templates” to the game based on the placement of the two blocks:

- Template #2:
  \[
  \begin{array}{cccc}
  R & S/T & P & Q \\
  1 & \_ & \_ & \_ \\
  \_ & \_ & \_ & \_ \\
  \_ & \_ & \_ & \_ \\
  \_ & \_ & \_ & \_ \\
  \end{array}
  \]
- Template #1:
  \[
  \begin{array}{cccc}
  R & S/T & P & Q \\
  1 & \_ & \_ & \_ \\
  \_ & \_ & \_ & \_ \\
  \_ & \_ & \_ & \_ \\
  \_ & \_ & \_ & \_ \\
  \end{array}
  \]

These two templates encompass four solution sets to the game and make it abundantly clear how the interaction of some rules and game restrictions...
can set off a series of powerful inferences. In a later chapter we will
discuss templates in detail, but you will see references to this approach
throughout the book. Templates result from restrictions within the game,
and in many games the best setup is one that shows these possibility
blueprints.

Consider one more example:

A doctor must see six patients—C, D, E, F, G and H—one after another, not
necessarily in that order. The patients must be seen according to the following
conditions:

E is seen exactly three patients after C.
D is seen immediately before F is seen.

Using the scenario and rules, we can produce the following initial setup:

C D E F G H

\[
\begin{array}{cccccc}
\text{C} & \_ & \_ & \_ & \_ & \text{E} \\
D & F & & & &
\end{array}
\]

Although this game has restrictions—the placement of the CE split-block
is limited to 1-4, 2-5, or 3-6—there are still many different solutions.
However, suppose for a moment that the test makers asked a question that
contained a specific condition, such as:

If G is seen third, which one of the following must be true?

The addition of this new condition affects the restrictions in the basic
diagram to such an extent that only one solution is possible:

Step One: G is seen third

\[
\begin{array}{cccccc}
1 & 2 & G & 4 & 5 & 6
\end{array}
\]

Step Two: The CE split-block must be placed into slots 1-4
because if it is placed in slots 2-5 there will be no room for the DF
block

\[
\begin{array}{cccccc}
1 & 2 & G & 4 & 5 & 6
\end{array}
\]
Step Three: The DF block must be placed into 5-6

$$\begin{array}{cccccc}
C & G & E & D & F \\
1 & 2 & 3 & 4 & 5 & 6
\end{array}$$

Step Four: H must be placed into 2

$$\begin{array}{cccccc}
C & H & G & E & D & F \\
1 & 2 & 3 & 4 & 5 & 6
\end{array}$$

Note that the random H, a variable with little power, is placed last.

After completing these steps in response to the question, you could then use the single solution to easily select the correct answer choice.

The point is that restrictions, when present in a game, never go away. You must always track them and be prepared for questions that will force you to address the restriction.

Avoiding False Inferences

The test makers always check to see if you have interpreted the rules correctly, and some rules are easier to misinterpret than others. Here are four mistakes that students often make:

Conditional Rule Reversal

As previously discussed, a conditional rule is triggered when the sufficient condition occurs. For example, consider the following rule:

When M is shown first, then O is shown sixth.

This rule would be diagrammed as:

$$\begin{array}{c}
M_1 \\
\rightarrow \\
O_6
\end{array}$$

When M appears in the first slot, then O must appear in the sixth slot. However, many test takers make the mistake of reversing the relationship, and when faced with O in the sixth slot, they assume that M must be in the first slot. This is not a valid inference, and this mistake is known as a Mistaken Reversal.
Misinterpreting Block Language

As discussed on pages 39 through 47, the test makers will use different language to denote different types of blocks. “Before” and “after” are used in one manner, whereas “between” has an entirely different meaning. Many students make the mistake of misreading this language, and then they draw inferences based on a relationship that is actually incorrect. You must always read each rule very carefully because making a mistake in the rules will almost always cause a high number of missed questions.

False Blocks

The test makers are savvy, and they know that the average student does not carefully read the language of the rules. Consider the following rule from a recent Linear game:

Each rock classic is immediately preceded on the CD by a new composition.

In this game, songs were being selected for a demo CD, and each song was classified as either a rock classic (R) or a new composition (N). Most students, upon reading the rule above, immediately diagrammed the rule as follows:

\[ \text{N} \quad \text{R} \]

However, this representation is incorrect. The diagram above implies that R and N are always in a block formation—that is, every time N appears then R immediately follows, and every time R appears then N immediately precedes. Take a moment to re-read the rule. Does the rule state that the two variables are in block formation? No, what the rules states is that every rock classic is preceded by a new composition. There is no statement that every new composition is followed by a rock classic. So, this rule is only triggered when a rock classic is present. Thus, the rule is conditional, and should be diagrammed as follows:

\[ \text{R} \quad \rightarrow \quad \text{N} \quad \text{R} \]

This representation correctly indicates that the relationship in the rule occurs when a rock classic is present. Under this representation, it becomes possible for two or more new compositions to appear in a row (NN, NNN, etc.).
False Not-Block Inferences

As discussed on page 47, not-blocks indicate that variables cannot be next to one another, or cannot be separated by a fixed amount of space. Some students make the mistake of combining not-blocks with Not Laws to arrive at false inferences. Consider the following two rules:

- B is not inspected the day before C is inspected.
- C cannot be inspected second.

The diagram for these two rules would be:

\[
\begin{array}{c}
\text{B} \\
\text{C}
\end{array}
\]

\[
\begin{array}{cccccc}
1 & 2 & 3 & 4 & 5 & 6
\end{array}
\]

Many students, after reviewing these two rules, make one of the following two errors:

1. They mistakenly conclude that B cannot be inspected first, and then place a B Not Law under slot 1. These students erroneously act as if the BC relationship is a regular (or positive) block: because C cannot be inspected second, if BC was a regular block, then B could not be inspected first.

2. They mistakenly conclude that B must be inspected second, and then place B into slot 2. The error here is to act as if the C Not Law on slot 2 then forces B into slot 2. That outcome does not have to occur, although, of course, B could be inspected second.

Remember, not-blocks only come into play when one of the variables in the not-block is placed on the diagram.
Also from PowerScore’s LSAT Logic Games Bible:
Conditional Sequencing

In certain Logic Games, some of the sequencing rules are stated in conditional fashion, meaning that certain sequential relationships are triggered by other events. These rules tend to come in two types: standard conditional relationships, and relationships that trigger two mutually exclusive possibilities. Let’s examine both.

Standard Conditional Relationships

Sequencing elements can be added to any conditional relationship, in the sufficient or necessary condition (or both). Consider the following example:

If D is taller than F, then X is taller than Y.

This rule is only enacted if D is taller than F, and most students diagram the rule as follows:

\[ D > F \implies X > Y \]

The contrapositive of the rule is a bit more interesting. Diagramming simply with negatives, the contrapositive appears as:

\[ X \napprox Y \implies D \napprox F \]

However, if this game includes no ties—and most Logic Games explicitly eliminate the possibility of ties—then when X is not taller than Y, it must be that Y is taller than X, and when D is not taller than F, it must be that F is taller than D. When this information is taken into account, the rule can be redisplayed as follows:

\[ Y > X \implies F > D \]

Thus, one of the most important considerations when you encounter a conditional sequencing rule is to examine the contrapositive, and if there are no ties, redisplay the relationships in a way that removes any negatives.
Mutually Exclusive Outcomes

In some cases, conditional sequencing rules can create two separate, mutually exclusive possibilities that then dictate the direction of the game. Consider the following example:

Either R is taller than S, or else R is taller than T, but not both.

Most students diagram the rule as follows:

- \( R > S \)
- \( R > T \)

While this representation is factually accurate, it does not capture the full truth of what is occurring with R, S, and T. Note that the rule uses the phrase “but not both,” which means that one or the other occurs, but that both cannot occur. So, when \( R > S \), it cannot also be the case that \( R > T \), and vice versa. But, in games in which no ties are possible (and most games fall into that category), if R is not taller than T, then T must be taller than R (T > R). When this relationship is added to the existing R > S, relationship, we can infer that T > R > S.

A similar case exists when R > T. Because R > S cannot also be true, we can infer that S > R, creating a chain of S > R > T.

Therefore, under this rule, only two arrangements of R, S, and T are possible:

1. \( T > R > S \)
   or
2. \( S > R > T \)

Thus, every solution to the game will conform to either the T > R > S sequence or to the S > R > T sequence. This is an incredibly powerful inference, and one that divides the game into two fundamentally different pathways. If you encounter a game that contains a similar rule, you should immediately recognize that two distinct possibilities exist, and explore both options in terms of how they interact with the remaining rules. Note also that the initial rule, while conditional in nature, does not use
one of the most common indicators (such as “if” or “only”) to create
conditionality. Instead, the conditional phrase “either/or, but not both” is
used. Interestingly, in many of the conditional sequencing rules that create
just two possible directions for the game, the phrase “but not both” is
present.

Here is another example that also creates two separate, mutually exclusive
possibilities, along with the two separate directions that result:

Example: R sings at some time before S or at some time after L, but not both.

\[
\begin{align*}
S \\
1. R & > - - - - \\
& L \\
\text{or} \\
2. S & > - - - - \\
& R \\
& L
\end{align*}
\]

Rules that create two distinct pathways have become increasingly common
on recent LSATs, and you must recognize these rules when they appear,
and understand the implications created by such rules. Here are several
games you can review that feature similar rules:

- December 2006 LSAT, Game #2
- September 2007 LSAT, Game #4
- December 2007 LSAT, Game #2
- October 2010 LSAT, Game #2

However, when considering conditional rules involving sequencing,
be careful not to assume that any sequencing rule stated in conditional
fashion automatically creates two and only two directions for the game.
Consider the following example:

If A’s presentation is earlier than B’s presentation, then B’s
presentation is earlier than C’s presentation.
Most students diagram the prior rule in the following manner:

\[ A > B \quad \rightarrow \quad B > C \]

This is an accurate diagram, but it does not perfectly capture the fact that functionally the rule creates an \( A > B > C \) chain when \( A \)'s presentation is known to be earlier than \( B \)'s presentation. Take a moment to consider the contrapositive of the above rule, which can be drawn as:

\[ B / \; C \quad \rightarrow \quad A / \; B \]

In games where no ties are possible, if \( B \)'s presentation is not earlier than \( C \)'s presentation, then we can infer that \( C > B \), and if \( A \)'s presentation is not earlier than \( B \)'s presentation, then we know that \( B > A \). Thus, the contrapositive actually appears as:

\[ C > B \quad \rightarrow \quad B > A \]

From a functional standpoint, then, the contrapositive creates a \( C > B > A \) chain when \( C \)'s presentation is known to be earlier than \( B \)'s presentation.

Combining the original statement and its contrapositive, many students improperly infer there are only two possible relationship possibilities for \( A, B, \) and \( C \) in this game:

1. \( A > B > C \)

or

2. \( C > B > A \)

But, while both sequences are possible, two other possible sequences also exist:

3. \( B > A > C \)

4. \( B > C > A \)
Thus, even though a conditional rule involving sequencing is present, the game is not divided into two basic paths. The general principle is that when conditional indicators appear, you should immediately analyze the rule to see if two mutually exclusive chains are created, but be aware that not all conditional rules involving sequencing create two and only two chains.
**Conditional Sequencing Diagramming Drill**

Use the Pure Sequencing and Conditional Sequencing Diagramming Guidelines to set up diagrams for each of the following rules. The rules may yield more than one chain per item. Assume no ties are possible. Answers on Page 386

1. **Rules:** If the earrings are more expensive than the necklace, then the ring must be more expensive than the brooch.

2. **Rules:** Either Sandoval is interviewed after both Kun and Newman, or both Kun and Newman are interviewed after Sandoval.

3. **Rules:** If R is older than T, then neither C nor D is older than F.
Conditional Sequencing Diagramming Drill

4. Rules: \( X \) is larger than \( Y \), or else \( X \) is larger than \( W \), but not both.

5. Rules: If Flores is hired before Hart, then \( F \) is also hired before Jun and Okonwo.

6. Rules: \( M \) is scheduled earlier than \( Q \), or scheduled later than \( T \), but not both.
Conditional Sequencing Diagramming Drill Answer Key

1. If the earrings are more expensive than the necklace, then the ring must be more expensive than the brooch.

   Diagram:  \[ E > N \rightarrow R > B \]

   Contrapositive:  \[ B > R \rightarrow N > E \]

2. Either Sandoval is interviewed after both Kun and Newman, or both Kun and Newman are interviewed after Sandoval.

   \[ K \rightarrow \underbrace{\text{---} \rightarrow S}_{N} \]

   or

   \[ \underbrace{\text{---} \rightarrow K}_{S} \rightarrow \text{---} \rightarrow N \]

3. If R is older than T, then neither C nor D is older than F.

   \[ R > T \rightarrow F > \underbrace{\text{---} \rightarrow C}_{D} \]

   The contrapositive of this rule would be enacted if C or D (or both) were older than F. The result would be that \( T > R \).
Conditional Sequencing Diagramming Drill Answer Key

4. X is larger than Y, or else X is larger than W, but not both.

   1. \( W > X > Y \)

   or

   2. \( Y > X > W \)

4. If Flores is hired before Hart, then Flores is also hired before Jun and Okonwo.

   \[
   \begin{align*}
   & F > H \\
   & F > J \\
   & F > O
   \end{align*}
   \]

   The contrapositive of this rule would be enacted if H, J, or O (or two or all three) were hired before F. The result would be that \( H > F \).

6. M is scheduled earlier than Q or scheduled later than T, but not both.

   \[
   \begin{align*}
   & Q \\
   & M > T
   \end{align*}
   \]

   or

   \[
   \begin{align*}
   & Q \\
   & T > M
   \end{align*}
   \]