Ordering Game # 1

Following the strategies developed earlier, we abbreviate the names by using the first letter of the name and then symbolize the conditions. "*Clyde is not standing in space 1, 3, or 5"* is symbolized as **C ≠ 1, 3, 5**. *"Gotti is the third person from the left"* is symbolized as **G = 3rd**. Note: the fact that Gotti is third does not force him into space 3—he could stand in spaces 3 or 4. *"Bugsy is standing to the immediate left of Nelson"* is symbolized as **BN**.

Our diagram will consist of six dashed lines, numbered 1 through 6 from left to right. Summarizing this information gives the following schematic:

B N D C G
C ≠ 1, 3, 5
G = 3rd
BN

_1_ _2_ _3_ _4_ _5_ _6_

Now, we decide the most effective order for placing the elements on the diagram. We look for a condition that fixes the position of an element. There is none. Next, we look for a condition that limits the position of an element. The second condition, *"Gotti is the third person from the left,"* limits Gotti to spaces 3 and 4. This condition, as often happens with ordering games, generates two diagrams: one with the empty space to Gotti's left and one with the empty space to his right:

Diagram I ___ ___ ___ _G_ ___ ___

Diagram II ___ ___ _G_ ___ ___ ___

Next, we look for a condition that connects two or more people. The last condition, **BN**, connects B with N. However, at this stage we cannot place it on the diagram. Finally, we look for a condition that states where a person cannot be standing. The first condition states that Clyde cannot be standing in space 1, 3, or 5. Noting this on the diagram yields

BNDCG (D "wild")
C ≠ 1, 3, 5
G = 3rd
BN

Diagram I _~C_ ___ _~C_ _G_ _~C_ ___

Diagram II _~C_ ___ _G_ ___ _~C_ ___

(Note: D is "wild" because the conditions do not refer to him. Thus D can stand in more positions than any other person.)

This diagram is self-contained. There is no need to refer to the original problem. If possible, always avoid rereading the problem. No further conditions can be derived, so we turn to the questions.

1. Nelson CANNOT stand in which one of the following spaces?
   (A) 2
   (B) 3
   (C) 4
   (D) 5
   (E) 6

The method of solution to this problem is rather mechanical: We merely place Nelson in one of the spaces offered. Then check whether it is possible to place the other people in the line-up without violating any initial condition. If so, then we eliminate that answer-choice. Then place Nelson in another space offered, and repeat the process.

To that end, place Nelson in space 2 in Diagram II:

_B_ _N_ _G_ ___ _~C_ ___

Next, Place Nelson in space 4. Then Diagram I is violated since G is already in space 4, and Diagram II is also violated since there is no room for the condition **BN**:

B?
___ ___ _G_ _N_ ___ ___

The answer is (C).

As you read the remaining solutions, note the determining power of the condition **BN**.

2. Which one of the following is a possible ordering of the 5 people from left to right?
   (A) Clyde, empty, Dutch, Gotti, Bugsy, Nelson
   (B) Bugsy, Clyde, Nelson, Gotti, Dutch, empty
   (C) Dutch, Bugsy, Gotti, Nelson, empty, Clyde
   (D) Dutch, Clyde, Gotti, empty, Nelson, Bugsy
   (E) Bugsy, Nelson, Gotti, Clyde, Dutch, empty

This problem is best solved by the method of elimination. To apply this method take a condition; test it against each answer-choice, eliminating any that violate it. Then take another condition; test it against the remaining answer-choices, eliminating any that violate it. Continue until only one answer-choice remains. Many students apply every condition to the first answer-choice, then every condition to the second answer-choice, and so on. This should be avoided since it's inefficient; however, sometimes there is no other option. Because this question type is relatively easy, it often is the first or second question asked.

The first condition contradicts choice (A) since Clyde cannot be first. It does not contradict the other choices. So eliminate (A) only. The second condition contradicts choice (B) since Gotti must be 3rd. It does not contradict the remaining choices. So eliminate (B) only. The third condition contradicts choices (C) and (D) since in neither choice is Bugsy to the immediate left of Nelson. It does not contradict the remaining choice. So eliminate (C) and (D) only. Thus, by process of elimination, we have learned the answer is (E).

To answer this question, we had to test all the conditions; often, however, we will find the answer before testing the last condition.

3. If space 6 is empty, which one of the following must be false?

(A) Clyde stands in space 4.
(B) Dutch stands in space 4.
(C) Clyde is to the left of Nelson.
(D) Clyde is to the right of Dutch.
(E) Nelson stands in space 2.

It is immediately apparent that with only five spaces, G must be in the third spot. Thus, our new diagram to work with is:

Modified Diagram

~C	___	G	___	~C

Working through the questions, we see that Clyde may stand in space 4. However, answer B is false. If Dutch stands in space 4, BN will be forced into spot 1 and 2, leaving Clyde in spot 5, where he is clearly not allowed.

Thus, the answer is B.

4. Which one of the following spaces CANNOT be empty?

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

Assume that space 1 is empty. First try Diagram I. The condition **BN** can be placed in spaces 2 and 3, D can be placed in space 5, and C can be placed in space 6—all without violating any initial condition:

Diagram I

X	B	N	G	D	C

Thus, space 1 *could be* empty. This eliminates (A).

Next, assume that space 2 is empty. In Diagram I, this forces **BN** into spaces 5 and 6:

Diagram I

___	X	___	G	B	N

Diagram II

~C	X	G	___	~C	___

However, this diagram does not leave room for C (recall **C ≠ 1, 3, 5**). Diagram I is thus impossible when space 2 is empty. Turning to Diagram II, we see immediately that space 2 cannot be empty, for this would make G second, violating the condition **G = 3rd**. Hence, Diagram II is also impossible when space 2 is empty.

Thus the answer is (B).

5. If Clyde stands in space 6, Dutch must stand in space

(A) 3 or 4
(B) 5 or 6
(C) 1 or 2
(D) 2 or 3
(E) 4 or 5

Adding the new condition, **C = 6th**, to the original diagrams yields

Diagram I

___	___	___	G	___	C

Diagram II

___ ___ _G_ ___ ___ _C_

In both diagrams, **BN** must come before G, and D must come after G, to insure that G is 3rd. This forces D into space 5 in Diagram I and into either space 4 or 5 in Diagram II. In either position, D does not violate any initial condition.

Hence the answer is (E).

Ordering Game # 2

Begin by symbolizing the conditions. *"Ford is not next to Mazda"* is naturally symbolized as **~(FM)**. *"Toyota is west of both Audi and Ford but east of Chrysler"* can be symbolized as **C—>T—>AF**, where the arrow points from west to east. The remaining conditions can be symbolized in like manner, which gives the following schematic:

ACFHMTV (V, H "wild")
~(FM)
A = 4th
FA or AF
C—>T—>AF

The diagram will consist of seven dashed lines.

Diagram I

1	2	3	4	5	6	7
C	T	F	A			

Diagram II

1	2	3	4	5	6	7
			A	F	~M	

6. Which one of the following dealerships CANNOT be next to Chrysler?

   (A) Toyota
   (B) Ford
   (C) Volkswagen
   (D) Hyundai
   (E) Mazda

Hint: Use the condition **C—>T—>AF**.

The answer is (B).

7. If Ford is east of Audi, then Hyundai CANNOT be next to both

(A) Toyota and Ford
(B) Chrysler and Toyota
(C) Ford and Mazda
(D) Ford and Volkswagen
(E) Toyota and Audi

Since Ford is east of Audi, use Diagram II and again the condition **C—>T—>AF**.

The answer is A.

8. If Volkswagen is west of Audi, then which one of the following must be false?

(A) Ford is east of Audi.
(B) Volkswagen is west of Toyota.
(C) Volkswagen is east of Toyota.
(D) Hyundai is west of Mazda.
(E) Hyundai is east of Mazda.

If Volkswagen is west of Audi, then, from the condition **C—>T—>AF**, we know that Ford must be east of Audi—otherwise Ford, Chrysler, Toyota, and Volkswagen would all be west of Audi, which would violate the condition **A = 4th**. Finally, use the condition **~(FM)**.

The answer is (E).

9. Which one of the following is a possible arrangement of the dealerships from west to east?

(A) C, F, T, A, H, M, V
(B) C, T, F, H, A, M, V
(C) V, C, T, A, F, M, H
(D) C, V, F, A, H, T, M
(E) H, C, T, A, F, V, M

This is a straightforward elimination problem: Take a condition. Test it against each answer-choice, eliminating any that violate it. Then take another condition; test it against the remaining answer-choices, eliminating any that violate it. Continue until only one answer-choice remains.

The answer is (E).

10. If Hyundai is west of Ford, which one of the following pairs of dealerships must be next to each other?

(A) Chrysler and Hyundai
(B) Volkswagen and Mazda
(C) Ford and Mazda
(D) Toyota and Audi
(E) Hyundai and Mazda

Hint: If Hyundai is west of Ford, then, from the condition **C—>T—>AF**, Ford must be east of Audi—otherwise Chrysler, Toyota, Hyundai, and Ford would all be west of Audi, which would violate the condition **A = 4th**.

The answer is B.

11. If the Volkswagen dealership is on the east end of the street, then which one of the following must be false?

(A) Chrysler is second from the west end of the street.
(B) Ford is east of Audi.
(C) Hyundai is on the west end of the street.
(D) Ford is west of Audi.
(E) Hyundai is fifth from the west end of the street.

This question is hard because it does not give us much information to work with. Volkswagen was a "wild card". That is, its position on the street was independent of the other dealerships— except for Audi. So knowing where the Volkswagen dealership is located will probably tell us little, if anything, about where the other dealerships are located. Furthermore, the question leads us astray by asking *"Which one of the following must be false?"* This prompts us to look directly for the false

answer. In problems of this type, however, it is often better to reword the question as *"All of the following could be true except."* Then look for and eliminate the true answer-choices.

We'll use an indirect proof to solve this problem. That is, for each answer-choice, we attempt to construct a possible ordering of the dealerships along the street. The one for which this is not possible will be the answer. Clearly, you should save questions like this for last, or skip them all together.

Begin with choice (A). In Diagram II, place Chrysler second from the west end of the street:

1	2	3	4	5	6	7
	C		A	F		V

Next, the condition **C—>T—>AF** forces T into space 3:

1	2	3	4	5	6	7
	C	T	A	F		V

We can place M in space 1 without violating the initial conditions:

1	2	3	4	5	6	7
M	C	T	A	F		V

Finally, this forces the "wild card", H, into space 6:

1	2	3	4	5	6	7
M	C	T	A	F	H	V

This diagram does not violate any initial condition, so (A) could be true. This eliminates (A). Now apply this method to the remaining answer-choices until you find the one that violates one or more of the conditions or until you have eliminated four of the five choices.

The answer is C.

Ordering Game # 3

12. What is the maximum possible number of different pairs of chairs in which Frank and Ruby could sit?

    (A) one
    (B) two
    (C) three
    (D) four
    (E) five

(A) No. See answer-choice (C).
(B) No. See answer-choice (C).
(C) Yes. As the following diagrams illustrate, Frank and Ruby can sit in chairs 1&2, or 2&3, or 3&4:

1	2	3	4	5	6	7
F	**R**	**H**	**T**	**I**	**S**	**J**

1	2	3	4	5	6	7
H	**R**	**F**	**T**	**I**	**S**	**J**

1	2	3	4	5	6	7
H	**T**	**F**	**R**	**I**	**S**	**J**

(D) No. See answer-choice (C).
(E) No. See answer-choice (C).

13. Which one of the following statements must be false?

    (A) Both Harry and Joel sit east of Frank.
    (B) Both Harry and Ruby sit east of Frank.
    (C) Both Harry and Joel sit west of Frank.

(D) Both Harry and Ruby sit west of Frank.
(E) Both Joel and Ruby sit east of Frank.

(A) No. The following diagram satisfies all the conditions and has both Harry and Joel seated east of Frank:

1	2	3	4	5	6	7
F	**R**	**H**	**T**	**I**	**S**	**J**

(B) No. See diagram to answer-choice (A).
(C) Yes. From Question 13, we know that Frank must sit in chair 1, 2, 3, or 4. Now, since Harry and Joel sit west of Frank, they must sit in chairs 1, 2, or 3. This puts 3 boys in chairs 1 through 4—violating the condition **Boy/Girl**.
(D) No. The following diagram satisfies all the conditions and has both Harry and Ruby seated west of Frank:

1	2	3	4	5	6	7
H	**R**	**F**	**T**	**I**	**S**	**J**

(E) No. See diagram to answer-choice (A).

14. If Thelma sits next to Ivan, and Frank sits next to Thelma, which one of the following statements could be false?
    (A) Both Frank and Ivan sit east of Ruby.
    (B) Both Frank and Ruby sit west of Thelma.
    (C) Both Frank and Sylvia sit east of Ruby.
    (D) Both Frank and Thelma sit west of Sylvia.
    (E) Both Frank and Ruby sit west of Joel.

Placing Thelma next to Ivan and Frank next to Thelma yields

1	2	3	4	5	6	7
		F	**T**	**I**	**S**	

Since Ruby sits next to Frank, Ruby must sit in space 2:

1	2	3	4	5	6	7
	R	**F**	**T**	**I**	**S**	

(A) No. See above diagram.
(B) No. See above diagram.
(C) No. See above diagram.
(D) No. See above diagram.
(E) Yes. Suppose in the above diagram that Joel sits in space 1. Then Harry would sit in space 7:

1	2	3	4	5	6	7
J	**R**	**F**	**T**	**I**	**S**	**H**

This diagram satisfies all the conditions and has both Frank and Ruby seated <u>east</u> of Joel.

15. If Frank does not sit next to any child who sits next to Ivan, which one of the following statements could be true?
    (A) Harry sits west of Frank.
    (B) Joel sits west of Ivan.
    (C) Ruby sits west of Frank.
    (D) Thelma sits west of Frank.
    (E) Thelma sits west of Ruby.

The condition *"Frank does not sit next to any child who sits next to Ivan"* means that Frank does not sit in space 3 or 7. Since the order is **Boy/Girl**, Frank must be in space 1. This in turn forces Ruby into space 2, **FR**:

Diagram I

1	2	3	4	5	6	7
F	**R**			**I**	**S**	

(A) No. See Diagram I.
(B) Yes. Suppose Joel sits in space 3. Then since the order is **Boy/Girl**, Harry and Thelma would be forced into spaces 7 and 4, respectively:

1	2	3	4	5	6	7
F	**R**	**J**	**T**	**I**	**S**	**H**

This diagram satisfies all the conditions and has Joel seated west of Ivan.
(C) No. See Diagram I.
(D) No. See Diagram I.
(E) No. See Diagram I.

16. If Frank sits east of Ruby, which one of the following pairs of children CANNOT sit next to each other?

    (A) Frank and Thelma
    (B) Harry and Ruby
    (C) Harry and Sylvia
    (D) Ivan and Ruby
    (E) Joel and Ruby

(A) No. The following diagram satisfies all the conditions and has Frank seated next to Thelma:

1	2	3	4	5	6	7
J	**R**	**F**	**T**	**I**	**S**	**H**

(B) No. The following diagram satisfies all the conditions and has Harry seated next to Ruby:

1	2	3	4	5	6	7
H	**R**	**F**	**T**	**I**	**S**	**J**

(C) No. See diagram to answer-choice (A).
(D) Yes. Since Frank now sits east of Ruby, the condition **FR** becomes **RF**, where R and F cannot be flip-flopped. From our previous work, we know that Ruby and Frank must sit west of Ivan. Hence, Frank will always be seated between Ruby and Ivan. Thus, Ruby and Ivan cannot sit next to each other.
(E) No. See diagram to answer-choice (A).

Ordering Game # 4

To make your diagrams, first place Adams on the schedule. The place Bates on the schedule.

The remaining variables are DE / ED who must be consecutive, and C, who can work anytime.

Diagram I: _A_ ___ ~B_ ___ ~B_

Diagram II: ___ ___ A ___ ~B_

17. Which one of the following is a possible work schedule?

    (A) Edwards, Bates, Adams, Drake, Cox
    (B) Bates, Adams, Cox, Edwards, Drake
    (C) Edwards, Drake, Adams, Cox, Bates
    (D) Adams, Bates, Edwards, Cox, Drake

(E) Drake, Edwards, Adams, Bates, Cox

(A) and (D) are not possible work schedules since Drake and Edwards must work on consecutive days. (B) is not a possible work schedule since Adams must work on Monday or Wednesday. (C) is not a possible work schedule since Bates will not work on Friday. Hence, by process of elimination, the answer is (E).

18. If Cox works on Tuesday, then all of the following statements must be true EXCEPT:
    (A) Bates works on Monday.
    (B) Adams works on Wednesday.
    (C) Drake could work on Thursday.
    (D) Edwards could work on Friday.
    (E) Drake could work on Wednesday.

Adding the new condition to the grid (and recalling only one person works each day) yields

Diagram I: _A_ _C_ ~B_ ___ ~B_

Diagram II: ___ _C_ _A_ ___ ~B_

Clearly, from the diagrams, either Drake or Edwards must work Friday. Further, since Drake and Edwards work on consecutive days, they must work Thursday and Friday. So Drake cannot work Wednesday. The answer is (E).

19. Which one of the following CANNOT be true?
    (A) Cox works on Thursday.
    (B) Edwards works on Monday.
    (C) Adams and Bates work on consecutive days.
    (D) Drake and Edwards work on consecutive days.
    (E) Cox works on Monday.

Begin with (A). Add "*Cox works on Thursday*" to the diagrams:

Diagram I: _A_ ___ ~B_ _C_ ~B_

Diagram II: ___ ___ _A_ _C_ ~B_

Now, the condition "*Drake and Edwards work on consecutive days*" generates two grids—one with Drake and Edwards working on Monday and Tuesday (not necessarily in that order) and one with Drake and Edwards working on Tuesday and Wednesday (not necessarily in that order):

Clearly, Diagram I leaves no day for Bates to work. And Diagram II forces Adams and Bates to work together on Monday, violating the condition that only one employee works at a time. Hence, Cox cannot work on Thursday.

The answer is (A).

20. If Bates works Thursday, which one of the following must be true?
    (A) Adams works Wednesday.
    (B) Drake works Tuesday.
    (C) Cox works Friday.
    (D) Edwards works Wednesday.
    (E) Adams works Monday.

Adding the condition "*Bates works Thursday*" yields

Diagram I: _A_ ___ __ _B_ __

Diagram II: ___ ___ _A_ _B_ __

Since Drake and Edwards must work on consecutive days, neither can work on

Friday. This leaves only Cox to work on Friday. The answer is (C).

21. If Adams and Bates CANNOT work on consecutive days, then which one of the following must be false?

    (A) Cox works Tuesday.
    (B) Edwards works Monday.
    (C) Drake works Tuesday.
    (D) Edwards works Wednesday.
    (E) Adams works Monday.

Diagram I: _A_ ___ ___ _B_ ___

Diagram II: _B_ ___ _A_ ___ ___

Either Adams or Bates will thus be forced to work on Monday. A quick review of the answer choices shows that the answer is (B).

22. If Bates CANNOT work either immediately before or after Edwards, then which one of the following must be false?

    (A) Edwards works on Monday.
    (B) Edwards works on Tuesday.
    (C) Edwards works on Wednesday.
    (D) Edwards works on Thursday.
    (E) Edwards works on Friday.

Diagram I: _A_ ___ ~B_ ___ ~B_

Diagram II: ___ ___ A ___ ~B_

Recall DE/ED must be consecutive.

Answer A is possible through diagram II. Answer B is possible through diagram I or II. Answer C is not possible because if Edwards works on Wednesday, it must be through diagram I and we can see that Bates is unable to work on Friday, thus he would be forced to work either immediately before or after Edwards.

The answer is (C).

Ordering Game # 5

This is a spatial ordering problem of above average difficulty. Begin by turning the conditions into symbols. The condition "*The zoology book is not next to the math book"* can be symbolized as **~(ZM)**. Note: although Z is written to the left of M in this symbol, that cannot be assumed on the diagram. We could just as easily have written ~(MZ). The flip-flop symbol could be used to remind us that the order is not fixed, but it would tend to clutter up the conditions. Just remember that the order in all the conditions of this game can be reversed.

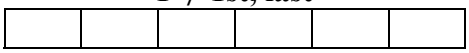
Next, the condition *"The math book and the history book are exactly two spaces apart"* can be symbolized as **M □ H**. Don't make the mistake of symbolizing this condition as M □ □ H. The statement "A and B are two spaces apart" means that only one spot separates them. The symbol A □ □ B, on the other hand, reads "A and B are three spaces apart."

Next, the condition *"At most one other book separates the art book from the chemistry book"* can be symbolized as **A □ C** (max 1).

Finally, the condition *"The physics book cannot be on either end of the shelf"* yields **P ≠ 1st, last**.

Our diagram will consist of six compartments—one for each book:

ACMHPZ
~(ZM)
M □ H
A □ C
max 1
P ≠ 1st, last



~P **~P**

There are no independent elements, no readily derived conditions, and no elements that can be placed on the diagram, so we turn to the questions.

23. If the math book is second from the left, then in which one of the following positions could the art book be located?

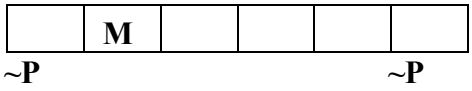
    (A) 2
    (B) 3
    (C) 4
    (D) 5
    (E) 6

This question asks *"Which one of the following could be true?"* This type of question is usually harder to answer than those that ask *"Which one of the following must be true?"* In general, the more information you have, the more likely it is that the order will be fully determined. In such cases, we only need to find one ordering.

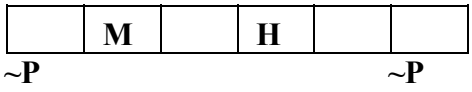
On the other hand, the less information you have the less likely it will be that only one order is possible. In these cases, there may be many orderings possible, but only one will be listed as an answer-choice. You may spend considerable time working out a possible order, only to be disappointed because it is not listed as an answer-choice. So if you are pressed for time, attempt the remaining *must*-questions before the *could*-questions. You may even want to preview the questions before you begin and then answer all the *must*-questions before tackling the *could*-questions.

I don't use this method myself, though. I find that I tend to lose concentration as I flash from one question to the next, trying to decide which ones are easier. Previewing can also waste precious time. Nonetheless, it may work for you, so experiment with it.

To begin, place the supplementary condition, *"the math book is second from the left,"* on the diagram as follows:



Next, the condition **M □ H** forces H into position 4:



Now, the condition **~(ZM)** forces Z into position 5 or 6. At this point, many students try to juggle the possible positions for Z in their heads. Unless you have a very strong memory, don't do it! Instead, write down a separate diagram for each of the two possible positions:

Diagram I

	M		H	Z	

~P ~P

Diagram II

	M		H		Z

~P

In Diagram I, P must be in position 3, as it cannot be at either end of the shelf:

Diagram I

	M	P	H	Z	

This, however, leaves no room for the condition **A** $\square_{\max 1}$ **C**. Hence Diagram I is invalid. In Diagram II, P could be placed in position 5:

Diagram II

	M		H	P	Z

Then C and A could be placed in positions 1 and 3, respectively:

Diagram II

C	M	A	H	P	Z

This diagram satisfies all the initial conditions, so it represents a possible ordering. The answer is (B).

24. The books located in positions 1, 2, and 3, respectively, could be

I. chemistry, math, and art
II. zoology, art, and math
III. art, chemistry, and history

(A) I only
(B) II only
(C) III only
(D) I and II only
(E) I, II, and III

This is a triple-multiple-choice question. Many students skip these questions, assuming that the LSAT writers have conspired against them. However, a modified elimination method works quite well on these questions.

This question illustrates why you should not erase your previous diagrams. Begin with Statement I. From the final diagram in Question 1, we see that the chemistry, math, and art books could be in positions 1, 2, and 3, respectively. Applying the modified elimination method, we eliminate answer-choices (B) and (C), since they don't contain Statement I. At this point, even if we can't solve this problem, we have significantly increased our chances of correctly guessing the answer.

Turning to Statement II, we try to construct a valid ordering for it. To this end, place Z, A, and M on the diagram as follows:

Z	A	M			

~P

Next, the condition **M** $\square$ **H** forces H into position 5:

Z	A	M		H	

~P

Now, since P cannot be last, it must be in position 4:

Z	A	M	P	H	

This diagram does not leave any room for the condition **A** $\square_{\max 1}$ **C**. Hence, Statement II is not possible. This eliminates (D) and (E), since both contain Statement II. Therefore, by process of elimination, we

have learned that the answer is (A), without having to check Statement III.

25. What is the highest numbered position in which the history book can be located, if the zoology and math books are both to the right of it?

(A) 1
(B) 2
(C) 3
(D) 4
(E) 5

In problems such as this one, start with the largest number and work your way up the list. The first choice for which you are able to construct a valid order is the answer.

We can quickly dismiss (E) since there are only six spaces and two books are to the right of H.

We can also quickly dismiss (D). If H were in position 4, then the zoology and math books would have to be in spaces 5 and 6. This, however, would violate the condition **~(ZM)**.

Next, if H is in position 3, then— from the condition **M □ H**, and the fact that M is to the right of H—we know that M must be in position 5:

		H		M	
~P					~P

This diagram leaves only positions 4 and 6 for Z. In either case, however, Z would be next to M, which again would violate the condition **~(ZM)**. This dismisses (C).

Next, if H is in position 2, then M must be in position 4:

	H		M		
~P					~P

In this case, it is possible to place Z in space 6 as follows:

	H		M		Z
~P					

Then, place P in position 5:

	H		M	P	Z

Finally, place A and C in positions 1 and 3, respectively:

A	H	C	M	P	Z

This diagram does not violate any initial condition. Hence, the largest numbered position that H could occupy is 2. The answer is (B).

26. Which one of the following is a possible arrangement of the six books on the shelf, from left to right?

(A) art, chemistry, physics, history, zoology, math
(B) history, art, math, chemistry, zoology, physics
(C) zoology, history, art, math, physics, chemistry
(D) zoology, chemistry, history, physics, math, art
(E) art, chemistry, math, physics, history, zoology

Never skip problems like this one; they are rarely difficult. We'll use elimination. (A) is not a possible arrangement since it has M next to Z. (B) is not a possible arrangement since it has P last. Neither (C) nor (D) is a possible arrangement since in each case more than one book separates A and C. Hence, by process of elimination, we have learned that the answer is (E).

27. If the physics book is in position 3, then which one of the following must be true?

(A) The chemistry book is in position 6.
(B) The zoology book is in position 1.
(C) The art book is in position 1.
(D) The math book is in position 6.
(E) The zoology book is in position 2.

To start, place P in position 3 on the diagram:

		P			

This yields two positions for the con-dition **M □ H**—2 and 4, or 4 and 6. This generates two diagrams:

Diagram I

	M	**P**	**H**		

Diagram II

		P	**M**		**H**

(Note: M and H can exchange places in each diagram.)

Now in Diagram II, the condition $\mathbf{A} \underset{\text{max 1}}{\square} \mathbf{C}$ must be in positions 1 and 2:

Diagram II

A	**C**	**P**	**M**		**H**

This forces Z into position 5, which violates the condition **~(ZM)**. Hence Diagram II is invalid. Turning to Diagram I, we see that the condition $\mathbf{A} \underset{\text{max 1}}{\square} \mathbf{C}$ forces A and C into positions 5 and 6, though not necessarily in that order:

Diagram I

	M	**P**	**H**	**A**	**C**

This forces Z into position 1, which violates the condition **~(ZM)**. Don't forget, however, that we can switch M and H:

Diagram I

Z	**H**	**P**	**M**	**A**	**C**

This diagram satisfies all the initial conditions plus the supplementary condition. It also displays Z in its only possible position. Hence the answer is (B).

Watch out for choice (A). Although C can be in position 6, it need not be: A and C can be flip flopped in the final diagram.

28. If the history and the math books are both to the left of the chemistry book, then which one of the following must be false?

(A) The art book is in position 3.
(B) The zoology book is in position 4.
(C) The history book is in position 2.
(D) The art book is in position 5.
(E) The chemistry book is in position 6.

In this problem, we have no choice but to apply an indirect proof. Start with (A). If the art book is in position 3, then, from the condition $\mathbf{A} \underset{\text{max 1}}{\square} \mathbf{C}$, there are four positions in which C can be placed—1, 2, 4, 5. We consider each in turn. Position 1 can be quickly ruled out. If C were in position 1, then clearly neither H nor M could be to its left. Similarly, position 2 can be ruled out. Next, place C in position 4 on the diagram:

		A	**C**		
~P					**~P**

Clearly, in this diagram, there is no room to place the condition **M ☐ H**. Hence, C cannot be in position 4. Next, place C in position 5:

		A		**C**	
~P					**~P**

From the new condition, *"both H and M are left of C,"* and the condition **M ☐ H**, we see that M and H must occupy positions 2 and 4, though not necessarily in that order:

	M	**A**	**H**	**C**	
~P					**~P**

This diagram, however, forces P to be either first or last, which violates the condition **P ≠ 1st, last**. This shows C cannot be in position 5. Hence, the art book cannot be in position 3, and the answer is (A).

Ordering Game # 6

The conditions can be symbolized as follows:

L—>O & U
G __ __ P
L between G & P
H ≠ first

_1_ _2_ _3_ _4_ _5_ _6_ _7_

Note, the flip-flop symbol will not be used in the symbol statement **G __ __ P**; just remember that G and P can be interchanged.

29. If G is played third, which one of the following disks must be played second?

(A) G
(B) H
(C) L
(D) O
(E) P

Since G is played third, the condition **G __ __ P** forces P into space 6:

_1_	_2_	_3_	_4_	_5_	_6_	_7_
		G			P	

The condition **L between G & P** forces L into spaces 4 or 5. But L cannot be in space 5 since that would leave no room for the condition **L—>O & U**. Thus, L must be in space 4:

_1_	_2_	_3_	_4_	_5_	_6_	_7_
		G	L	O/U	P	O/U

Finally, since **H ≠ first**, H must be played second. The answer is (B).

30. If L and O are played consecutively, which one of the following cannot be true?

    (A) S is played second
    (B) G is played second
    (C) L is played third
    (D) O is played forth
    (E) H is played sixth

Suppose S is played second.

1	2	3	4	5	6	7
	S					

Since "L and O are played consecutively" and L is between G & P, the disks G, L, O, and P must be played consecutively. Now, G, L, O, and P cannot be placed in spaces 4, 5, 6, and 7 since that would violate the condition **L—>O & U**. So G, L, O, and P must be place in spaces 3, 4, 5, and 6:

1	2	3	4	5	6	7
	S	G	L	O	P	U

(Note, P and G can be interchanged in the diagram.) However, this diagram leaves no room for H (**H ≠ first**). Hence, S cannot be played second and the answer is (A).

31. What is the maximum number of disks that can separate S from U?

    (A) 1
    (B) 2
    (C) 3
    (D) 4
    (E) 5

The following diagram satisfies all the conditions and has S in space 1 and U in space 7:

1	2	3	4	5	6	7
S	G	L	H	P	O	U

Hence, a maximum of 5 disks can separate S from the U. The answer is (E).

32. If S is played second, which one of the following cannot be true?

    (A) G is played sixth
    (B) L is played third
    (C) U is played seventh
    (D) U is played fifth
    (E) H is played fifth

Suppose G is played sixth:

1	2	3	4	5	6	7
	S				G	

Then the condition **G __ __ P** forces P into space 3:

1	2	3	4	5	6	7
	S	P			G	

The conditions **L—>O & U** and **L between G & P** yield

1	2	3	4	5	6	7
	S	P	L	O/U	G	O/U

However, this diagram does not leave any room for H (**H ≠ first**). The answer is (A).

Ordering Game # 7

The condition *"No boy sits next to another boy"* means that the arrangement will be boy/girl/boy/girl . . . , which is naturally symbolized as **Boy/Girl**. The condition *"Ivan sits next to and east of the fourth child in the row"* simply means that Ivan is 5th, which can be symbolized as **I = 5th**. The condition *"Sylvia sits east of Ivan"* forces Sylvia into space 6 or 7. However, since the arrangement is **Boy/Girl**, Sylvia must be in space 6, **S = 6th**. The final condition, *"Frank sits next Ruby,"* is naturally symbolized as **FR**, where F and R can be flip-flopped.

Boys FHIJ Girls RST

Boy/Girl
I = 5th
S = 6th
FR

(West) 1 2 3 4 5 6 7 (East)
I S

33. What is the maximum possible number of different pairs of chairs in which Frank and Ruby could sit?

(A) one
(B) two
(C) three
(D) four
(E) five

(A) No. See answer-choice (C).
(B) No. See answer-choice (C).
(C) Yes. As the following diagrams illustrate, Frank and Ruby can sit in chairs 1&2, or 2&3, or 3&4:

1	2	3	4	5	6	7
F	**R**	**H**	**T**	**I**	**S**	**J**

1	2	3	4	5	6	7
H	**R**	**F**	**T**	**I**	**S**	**J**

1	2	3	4	5	6	7
H	**T**	**F**	**R**	**I**	**S**	**J**

(D) No. See answer-choice (C).
(E) No. See answer-choice (C).

34. Which one of the following statements must be false?

(A) Both Harry and Joel sit east of Frank.
(B) Both Harry and Ruby sit east of Frank.
(C) Both Harry and Joel sit west of Frank.
(D) Both Harry and Ruby sit west of Frank.
(E) Both Joel and Ruby sit east of Frank.

(A) No. The following diagram satisfies all the conditions and has both Harry and Joel seated east of Frank:

1	2	3	4	5	6	7
F	**R**	**H**	**T**	**I**	**S**	**J**

(B) No. See diagram to answer-choice (A).
(C) Yes. From Question 13, we know that Frank must sit in chair 1, 2, 3, or 4. Now, since Harry and Joel sit west of Frank, they must sit in chairs 1, 2, or 3. This puts 3 boys in chairs 1 through 4—violating the condition **Boy/Girl**.
(D) No. The following diagram satisfies all the conditions and has both Harry and Ruby seated west of Frank:

1	2	3	4	5	6	7
H	**R**	**F**	**T**	**I**	**S**	**J**

(E) No. See diagram to answer-choice (A).

35. If Thelma sits next to Ivan, and Frank sits next to Thelma, which one of the following statements could be false?
    (A) Both Frank and Ivan sit east of Ruby.
    (B) Both Frank and Ruby sit west of Thelma.
    (C) Both Frank and Sylvia sit east of Ruby.
    (D) Both Frank and Thelma sit west of Sylvia.
    (E) Both Frank and Ruby sit west of Joel.

Placing Thelma next to Ivan and Frank next to Thelma yields

1	2	3	4	5	6	7
		F	**T**	**I**	**S**	

Since Ruby sits next to Frank, Ruby must sit in space 2:

1	2	3	4	5	6	7
	R	**F**	**T**	**I**	**S**	

(A) No. See above diagram.
(B) No. See above diagram.
(C) No. See above diagram.
(D) No. See above diagram.
(E) Yes. Suppose in the above diagram that Joel sits in space 1. Then Harry would sit in space 7:

1	2	3	4	5	6	7
J	**R**	**F**	**T**	**I**	**S**	**H**

This diagram satisfies all the conditions and has both Frank and Ruby seated <u>east</u> of Joel.

36. If Frank does not sit next to any child who sits next to Ivan, which one of the following statements could be true?
    (A) Harry sits west of Frank.
    (B) Joel sits west of Ivan.
    (C) Ruby sits west of Frank.
    (D) Thelma sits west of Frank.
    (E) Thelma sits west of Ruby.

The condition *"Frank does not sit next to any child who sits next to Ivan"* means that Frank does not sit in space 3 or 7. Since the order is **Boy/Girl**, Frank must be in space 1. This in turn forces Ruby into space 2, **FR**:

Diagram I

1	2	3	4	5	6	7
F	**R**			**I**	**S**	

(A) No. See Diagram I.
(B) Yes. Suppose Joel sits in space 3. Then since the order is **Boy/Girl**, Harry and Thelma would be forced into spaces 7 and 4, respectively:

1	2	3	4	5	6	7
F	**R**	**J**	**T**	**I**	**S**	**H**

This diagram satisfies all the conditions and has Joel seated west of Ivan.

(C) No. See Diagram I.

(D) No. See Diagram I.

(E) No. See Diagram I.

37. If Frank sits east of Ruby, which one of the following pairs of children CANNOT sit next to each other?

    (A) Frank and Thelma
    (B) Harry and Ruby
    (C) Harry and Sylvia
    (D) Ivan and Ruby
    (E) Joel and Ruby

(A) No. The following diagram satisfies all the conditions and has Frank seated next to Thelma:

1	2	3	4	5	6	7
J	**R**	**F**	**T**	**I**	**S**	**H**

(B) No. The following diagram satisfies all the conditions and has Harry seated next to Ruby:

1	2	3	4	5	6	7
H	**R**	**F**	**T**	**I**	**S**	**J**

(C) No. See diagram to answer-choice (A).

(D) Yes. Since Frank now sits east of Ruby, the condition **FR** becomes **RF**, where R and F cannot be flip-flopped. From our previous work, we know that Ruby and Frank must sit west of Ivan. Hence, Frank will always be seated between Ruby and Ivan. Thus, Ruby and Ivan cannot sit next to each other.

(E) No. See diagram to answer-choice (A).

<u>Ordering Game # 8</u>

The condition *"H's session must take place at some time before Z's session"* can be symbolized as **H—>Z**. The condition *"K's session is always scheduled for the day immediately before or the day immediately after the day for which O's session is scheduled"* simply means that K and O must be scheduled on consecutive days; it can be symbolized as **KO** (note, the positions of K and O can be interchanged). Symbolizing the remaining conditions yields

H, I, K, O, U, Z
1 day = 2 students
H—>Z
I = Th
KO
M ≠ 2 & W ≠ 2

	~2		~2		
M		Tu		W	Th	F
					I	

38. (A) No. Adding H and U to the diagram yields

1	2	1	1	1
M	Tu	W	Th	F
	H		**I**	
	U			

This diagram shows that there is no room to place the condition **KO**.
(B) No. Adding H and Z to the diagram yields

1	2	1	1	1
M	Tu	W	Th	F
	H		**I**	
	Z			

This diagram shows that there is no room to place the condition **KO**.
(C) No. K and O must be scheduled on consecutive days.
(D) Yes. The following is one of two scenarios that satisfy all the conditions:

M	Tu	W	Th	F
H	**O**	**K**	**I**	**Z**
	U			

(E) No. Adding U and Z to the diagram yields

1	2	1	1	1
M	Tu	W	Th	F
	U		**I**	
	Z			

This diagram shows that there is no room to place the condition **KO**.

39. (A) No. Z's session must be scheduled after H's session, **H—>Z**, and only one student can be scheduled for Monday.
(B) Yes. With K and Z scheduled for Tuesday, we get the following unique ordering:

M	Tu	W	Th	F
H	**K**	**O**	**I**	**U**
	Z			

(C) No. With K and Z scheduled for Tuesday, we get the following unique ordering:

M	Tu	W	Th	F
H	**K**	**O**	**I**	**U**
	Z			

(D) No. With K and Z scheduled for Tuesday, we get the following unique ordering:

M	Tu	W	Th	F
H	**K**	**O**	**I**	**U**
	Z			

(E) No. With K and Z scheduled for Tuesday, we get the following unique ordering:

M	Tu	W	Th	F
H	**K**	**O**	**I**	**U**
	Z			

40. (A) No. Following is one of several counterexamples:

M	Tu	W	Th	F
U	**K**	**O**	**I**	**Z**
			H	

(B) No. Following is one of several counterexamples:

M	Tu	W	Th	F
K	**U**	**H**	**I**	**Z**
	O			

(C) No. Following is one of several counterexamples:

M	Tu	W	Th	F
K	**O**	**U**	**I**	**Z**
			H	

(D) Yes. Place U on the diagram:

M	Tu	W	Th	F

			I	
			U	

This diagram shows that the condition **KO** must be placed on Monday/Tuesday or Tuesday/Wednesday. Hence, one of the days Monday, Tuesday, or Wednesday is left for H and Z. But since H must be scheduled before Z, Z must be scheduled on Friday.

(E) No. Following is one of several counterexamples:

M	Tu	W	Th	F
K	**O**	**H**	**I**	**U**
				Z

41. (A) No. From the conditions **H—>Z** and **M≠2**, we know that Z cannot be scheduled for Monday.

(B) No. Following are two valid scenarios with U scheduled on different days:

M	Tu	W	Th	F
H	**Z**	**K**	**I**	**U**
			O	

M	Tu	W	Th	F
H	**Z**	**U**	**I**	**K**
			O	

(C) No. Following are two valid scenarios with U scheduled on different days:

M	Tu	W	Th	F
K	**O**	**Z**	**I**	**U**
	H			

M	Tu	W	Th	F
U	**H**	**Z**	**I**	**O**
			K	

(D) Yes. Place Z on the diagram:

M	Tu	W	Th	F
			I	
			Z	

This diagram shows that the condition **KO** must be placed on Monday/Tuesday or Tuesday/Wednesday. Since H must be scheduled before Z, H must be scheduled on Monday or Wednesday, which forces U to be scheduled on Friday.

(E) No. Following are two valid scenarios with U scheduled on different days:

M	Tu	W	Th	F
K	**O**	**U**	**I**	**Z**
			H	

M	Tu	W	Th	F
U	**K**	**O**	**I**	**Z**
			H	

42. (A) Yes. Scheduling U for Monday and H for Tuesday yields the following diagram:

M	Tu	W	Th	F
U	**H**		**I**	

The condition **KO** can be placed on the diagram as follows:

M	Tu	W	Th	F
U	**H**	**O**	**I**	
	K			

Finally, placing Z on Friday yields the following valid scenario:

M	Tu	W	Th	F
U	**H**	**O**	**I**	**Z**
	K			

Note, the supplemental condition *"H's session is scheduled as the next session after U's session"* is not needed for this or any of the other answer-choices. It is not uncommon for the LSAT writers to introduce superfluous conditions.

(B) No. H cannot be scheduled for Friday since H must be scheduled before Z. Note, Z cannot also be scheduled for Friday since there are already two people—I and U—scheduled for Thursday.
(C) No. Place U and H on the diagram:

M	Tu	W	Th	F
	U		**I**	
	H			

This diagram leaves no room to place the condition **KO**.
(D) No. This would schedule three people—I, U, and H—for Thursday. But the setup to the game states that exactly one person is scheduled for each day, except for one day when two people are scheduled.
(E) No. H cannot be scheduled for Friday with U since H must be scheduled before Z.

Ordering Game # 9

The conditions can be symbolized as follows:

LO
L—>news
G __ __ P

1	2	3	4	5	6	7

Note, G and P in the symbol statement **G __ __ P** can be interchanged.

43. (A) No. Since G is played second, the condition **G __ __ P** forces P into space 5:

1	2	3	4	5	6	7
	G			P		

Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition
L—>news. Hence, the condition **LO** must be placed in spaces 3 and 4:

1	2	3	4	5	6	7
	G	L	O	P		

Thus, L must be in space 3.
(B) No. Since G is played second, the condition **G __ __ P** forces P into space 5:

1	2	3	4	5	6	7
	G			P		

Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition
L—>news. Hence, the condition **LO** must be placed in spaces 3 and 4:

1	2	3	4	5	6	7
	G	L	O	P		

Thus, L must be in space 3.
(C) Yes. Since G is played second, the condition **G __ __ P** forces P into space 5:

1	2	3	4	5	6	7
	G			P		

Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition
L—>news. Hence, the condition **LO** must be placed in spaces 3 and 4:

1	2	3	4	5	6	7
	G	L	O	P		

Thus, L must be in space 3.
(D) No. Since G is played second, the condition **G __ __ P** forces P into space 5:

1	2	3	4	5	6	7
	G			P		

Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition
L—>news. Hence, the condition **LO** must be placed in spaces 3 and 4:

1	2	3	4	5	6	7
	G	L	O	P		

Thus, L must be in space 3.
(E) No. Since G is played second, the condition **G __ __ P** forces P into space 5:

1	2	3	4	5	6	7
	G			P		

Now, the condition **LO** cannot be placed in spaces 6 and 7 because that would violate the condition
L—>news. Hence, the condition **LO** must be placed in spaces 3 and 4:

1	2	3	4	5	6	7
	G	L	O	P		

Thus, L must be in space 3.

44. (A) Yes. Place the news in slot 2:

1	2	3	4	5	6	7
	news					

Now, the condition **L—>news** forces L into slot 1:

1	2	3	4	5	6	7
L	news					

However, this diagram leaves no room for the condition **LO**. So the news tape cannot be played second.
(B) No. The following valid diagram has the news in slot 3:

1	2	3	4	5	6	7
L	O	news	G	H	S	P

(C) No. The following valid diagram has the news in slot 4:

1	2	3	4	5	6	7
L	O	P	news	H	G	S

(D) No. The following valid diagram has the news in slot 5:

1	2	3	4	5	6	7
G	L	O	P	news	H	S

(E) No. The following valid diagram has the news in slot 6:

1	2	3	4	5	6	7
H	G	L	O	P	news	S

45. (A) No. H and S can be the first and last tapes played, respectively, as the following valid diagram illustrates:

1	2	3	4	5	6	7
H	G	L	O	P	news	S

(B) No. This violates the condition **L—>news**.
(C) Yes. Placing the information on the diagram yields

1	2	3	4	5	6	7
H	G	L				

The condition **LO** forces O into slot 4, and the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
H	G	L	O	P		

To be scheduled as far from H as possible, S must be in slot 7, which forces the news into slot 6:

1	2	3	4	5	6	7
H	G	L	O	P	news	S

This diagram satisfies all the conditions and has H, G, and L in the first, second, and third time slots, respectively.
(D) No. Place the information on the diagram:

1	2	3	4	5	6	7
H	L	O				S

Clearly, there is no room on this diagram to place the condition **G __ __ P**.
(E) No. H and S can be the first and last tapes played, respectively, as the following valid diagram illustrates:

1	2	3	4	5	6	7
H	G	L	O	P	news	S

46. (A) No. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G __ __ P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition
L—>news. This yields

1	2	3	4	5	6	7
	G	L	O	P		

Hence, L must be played third. Note, this question is essentially identical to Question 1. It is not uncommon for the LSAT writers to ask the same question in different forms.
(B) No. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G __ __ P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition
L—>news. This yields

1	2	3	4	5	6	7
	G	L	O	P		

Hence, L must be played third. Note, this question is essentially identical to Question 1. It is not uncommon for the LSAT writers to ask the same question in different forms.
(C) Yes. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G __ __ P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition
L—>news. This yields

1	2	3	4	5	6	7

G L O P

Hence, L must be played third. Note, this question is essentially identical to Question 1. It is not uncommon for the LSAT writers to ask the same question in different forms.

(D) No. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G** __ __ **P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition **L—>news**. This yields

1	2	3	4	5	6	7
	G	L	O	P		

Hence, L must be played third. Note, this question is essentially identical to Question 1. It is not uncommon for the LSAT writers to ask the same question in different forms.

(E) No. Place the new condition:

1	2	3	4	5	6	7
				P		

Then the condition **G** __ __ **P** forces G into space 2:

1	2	3	4	5	6	7
	G			P		

The condition **LO** must be placed in positions 3 and 4; in spaces 6 and 7 it would violate the condition **L—>news**. This yields

1	2	3	4	5	6	7
	G	L	O	P		

Hence, L must be played third. Note, this question is essentially identical to Question 1. It is not uncommon for the LSAT writers to ask the same question in different forms.

47. (A) No. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G** __ __ **P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

(B) No. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G** __ __ **P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

(C) No. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

(D) No. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

(E) Yes. Suppose S is in the first slot and the news is in the last slot:

1	2	3	4	5	6	7
S						news

Next, if G is placed in slot 2, then the condition **G __ __ P** forces P into slot 5:

1	2	3	4	5	6	7
S	G			P		news

The condition **LO** must be placed in slots 3 and 4, which in turn forces H into slot 6:

1	2	3	4	5	6	7
S	G	L	O	P	H	news

This diagram satisfies all the conditions. Hence, a maximum of 5 tapes can separate S from the news.

48. (A) No. The following diagram satisfies all the conditions and has L fourth:

1	2	3	4	5	6	7
H	S	G	L	O	news	P

(B) No. The following diagram satisfies all the conditions and has L fifth:

1	2	3	4	5	6	7
G	H	S	P	L	O	news

(C) Yes. Suppose L is played fifth. Then the condition **LO** forces O to be played sixth, and the condition **L—>news** forces the news to be played seventh:

1	2	3	4	5	6	7
				L	O	news

Now, the condition **G __ __ P** can be placed as follows:

1	2	3	4	5	6	7
G			P	L	O	news

This diagram satisfies all the conditions. Hence, L can be played fifth. Furthermore, L cannot be played sixth or seventh because that would violate the conditions **LO** and **L—>news**.
(D) No. From the two conditions **LO** and **L—>news**, we see that L can be scheduled no later than fifth.
(E) No. This violates the condition **LO**.

49. (A) No. The following valid diagrams have O in different time slots:

1	2	3	4	5	6	7
G	L	O	P	news	H	S

1	2	3	4	5	6	7
G	H	S	P	L	O	news

(B) No. The following valid diagrams have O in different time slots:

1	2	3	4	5	6	7
L	O	G	news	H	P	S

1	2	3	4	5	6	7
H	S	G	L	O	P	news

(C) No. The following valid diagrams have O in different time slots:

1	2	3	4	5	6	7
L	O	news	G	H	S	P

1	2	3	4	5	6	7
H	L	O	G	news	S	P

(D) Yes. If G is fifth, then the condition **G __ __ P** forces P into slot 2:

1	2	3	4	5	6	7
	P			G		

The condition **LO** cannot be placed in slots 6 and 7 since that would violate the condition **L—>news**. Hence, **LO** must be placed in slots 3 and 4. Therefore, O can only be played fourth.
(E) No. The following valid diagrams have O in different time slots:

1	2	3	4	5	6	7
L	O	P	news	H	G	S

1	2	3	4	5	6	7
H	S	P	L	O	G	news