

Questions 1-5

On the basis of an examination, nine students—Fred, Glen, Hilary, Ida, Jan, Kathy, Laura, Mike, and Nick—are each placed in one of three classes. The three highest scorers are placed in the level 1 class; the three lowest scorers are placed in the level 3 class. The remaining three are placed in the level 2 class. Each class has exactly three students.

Ida scores higher than Glen.
Glen scores higher than both Jan and Kathy.
Jan scores higher than Mike.
Mike scores higher than Hilary.
Hilary scores higher than Nick.
Kathy scores higher than both Fred and Laura.

- How many different combinations of students could form the level 1 class?
 - one
 - two
 - three
 - four
 - six
- Which one of the following students could be in the level 2 class but cannot be in the level 3 class?
 - Fred
 - Glen
 - Jan
 - Kathy
 - Nick
- Which one of the following students could be placed in any one of the three classes?
 - Fred
 - Jan
 - Kathy
 - Laura
 - Mike
- The composition of each class can be completely determined if which one of the following pairs of students is known to be in the level 2 class?
 - Fred and Kathy
 - Fred and Mike
 - Hilary and Jan
 - Kathy and Laura
 - Laura and Mike
- Which one of the following pairs of students cannot be in the same class as Fred?
 - Hilary and Nick
 - Jan and Laura
 - Kathy and Laura
 - Jan and Mike
 - Laura and Mike

Questions 6-12

Six reviewers—Frank, George, Hilda, Jackie, Karl, and Lena—will review four movies—*Mystery*, *Retreat*, *Seasonings*, and *Wolves*—according to the following conditions:

Each reviewer reviews exactly one movie, and each movie is reviewed by at least one of the six reviewers.

Hilda reviews the same movie as Frank.

Lena reviews the same movie as exactly one other reviewer.

George reviews *Mystery*.

Jackie reviews either *Mystery* or else *Wolves*.

Hilda does not review *Wolves*.

- If Lena reviews *Seasonings*, which one of the following must be true?
 - Hilda reviews *Retreat*.
 - Jackie reviews *Seasonings*.
 - Karl reviews *Mystery*.
 - Karl reviews *Retreat*.
 - Karl reviews *Wolves*.
- If Karl does not review *Seasonings*, which one of the following must be true?
 - Lena reviews *Mystery*.
 - Lena reviews *Retreat*.
 - Lena reviews *Seasonings*.
 - Frank and Hilda review *Retreat*.
 - Frank and Hilda review *Seasonings*.
- Which one of the following is a complete and accurate list of the movies each of which could be the movie that Lena reviews?
 - Mystery*, *Retreat*
 - Retreat*, *Seasonings*
 - Mystery*, *Seasonings*, *Wolves*
 - Retreat*, *Seasonings*, *Wolves*
 - Mystery*, *Retreat*, *Seasonings*, *Wolves*
- Which one of the following can be true?
 - Frank and George review *Mystery*.
 - Frank and Lena review *Wolves*.
 - George and Jackie review *Mystery*.
 - Karl reviews *Wolves* and Lena reviews *Mystery*.
 - Lena reviews *Retreat* and Frank reviews *Seasonings*.
- Lena can review any of the following EXCEPT
 - Mystery* with George
 - Mystery* with Karl
 - Retreat* with Karl
 - Seasonings* with Karl
 - Wolves* with Jackie

11. If Karl reviews the same movie as exactly one other reviewer, which one of the following is a complete and accurate list of the movies any one of which could be the movie that these two reviewers review?
- (A) *Mystery, Retreat*
 (B) *Mystery, Seasonings*
 (C) *Retreat, Seasonings*
 (D) *Mystery, Seasonings, Wolves*
 (E) *Retreat, Seasonings, Wolves*
12. Which one of the following is an acceptable assignment of reviewers to movies?
- | | <u><i>Mystery</i></u> | <u><i>Retreat</i></u> | <u><i>Seasonings</i></u> | <u><i>Wolves</i></u> |
|-----|-----------------------|-----------------------|--------------------------|----------------------|
| (A) | George | Frank, Hilda | Jackie, Lena | Karl Jackie |
| (B) | George | Frank, Hilda | Karl, Lena | Frank, Hilda |
| (C) | George | Karl, Lena | Jackie Lena | Jackie Karl |
| (D) | George, Karl | Frank, Hilda | Frank, Hilda | |
| (E) | Jackie | George, Lena | | |
15. If the first word in a sentence is "blender" and the third word is "slender," then the second word can be
- (A) bender
 (B) gender
 (C) lender
 (D) sender
 (E) tender
16. If the first word in a sentence consists of nine letters then the minimum number of letters that the fourth word can contain is
- (A) four
 (B) five
 (C) six
 (D) seven
 (E) eight
17. If "clean" is the first word in a sentence and "learn" is another word in the sentence, then which one of the following is a complete and accurate list of the positions each of which could be the position in which "learn" occurs in the sentence?
- (A) second
 (B) third
 (C) fourth, fifth
 (D) second, third, fourth
 (E) third, fourth, fifth

Questions 13-18

In a game, "words" (real or nonsensical) consist of any combination of at least four letters of the English alphabet. Any "sentence" consists of exactly five words and satisfies the following conditions:

The five words are written from left to right on a single

line in alphabetical order.

The sentence is started by any word, and each successive word is formed by applying exactly one of three operations to the word immediately to its left: delete one letter; add one letter; replace one letter with another letter. At most three of the five words begin with the same

letter as one another.

Except for the leftmost word, each word is formed by a different operation from that which formed the word immediately to its left.

13. Which one of the following could be a sentence in the word game?
- (A) bzeak bleak leak peak pea
 (B) crbek creek reek seek sxeek
 (C) dteam gleam glean lean mean
 (D) feed freed reed seed seeg
 (E) food fool fools fopls opl
14. The last letter of the alphabet that the first word of a sentence in the word game can begin with is
- (A) t
 (B) w
 (C) x
 (D) y
 (E) z
18. If the first word in a sentence consists of four letters, then the maximum number of letters that the fifth word in this sentence could contain is
- (A) four
 (B) five
 (C) six
 (D) seven
 (E) eight

Questions 19-24

A soloist will play six different guitar concertos, exactly one each Sunday for six consecutive weeks. Two concertos will be selected from among three concertos by Giuliani—H, J, and K; two from among four concertos by Rodrigo—M, N, O, and P; and two from among three concertos by Vivaldi—X, Y, and Z. The following conditions apply without exception:

If N is selected, then J is also selected.

If M is selected, then neither J nor O can be selected.

If X is selected, then neither Z nor P can be selected.

If both J and O are selected, then J is played at some time before O.

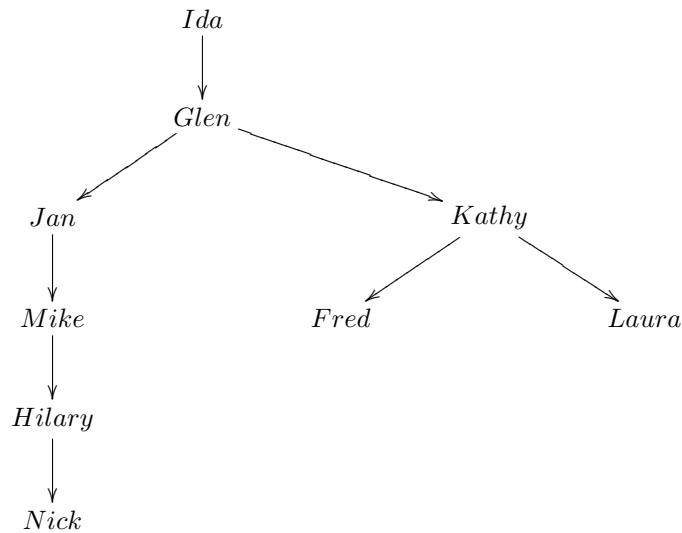
X cannot be played on the fifth Sunday unless one of Rodrigo's concertos is played on the first Sunday.

19. Which one of the following is an acceptable selection of concertos that the soloist could play on the first through the sixth Sunday?
- | | | | | | | |
|-----|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| (A) | H | Z | M | N | Y | K |
| (B) | K | J | Y | O | Z | N |
| (C) | K | Y | P | J | Z | M |
| (D) | P | Y | J | H | X | O |
| (E) | X | N | K | O | J | Z |
20. If the six concertos to be played are J, K, N, O, Y, and Z and if N is to be played on the first Sunday, then which one of the following concertos CANNOT be played on the second Sunday?
- (A) J
(B) K
(C) O
(D) Y
(E) Z
21. If J, O, and Y are the first three concertos to be played, not necessarily in the order given, which one of the following is a concerto that CANNOT be played on the fifth Sunday?
- (A) H
(B) K
(C) N
(D) P
(E) X
22. If O is selected for the first Sunday, which one of the following is a concerto that must also be selected?
- (A) J
(B) K
(C) M
(D) N
(E) X
23. Which one of the following is a concerto that must be selected?
- (A) J
(B) K
(C) O
(D) Y
(E) Z
24. Which one of the following is a concerto that CANNOT be selected together with N ?
- (A) M
(B) O
(C) P
(D) X
(E) Z

1 Reasoning Puzzles (Partial Sample Solutions)

1.1 Questions 1-5

From the information we get the ordering:



What does this tell us?:

1. Ida and Glen are the top two
2. The next highest is Jan or Kathy

giving the following matrix:

	Fred	Glen	Hilary	Ida	Jan	Kathy	Laura	Mike	Nick
1	N	Y	N	Y			N	N	N
2		N		N					
3		N		N					

Answers to Questions:

1. Jan and Kathy are the only two left that could be in the level 1 class, thus the answer is 2 (B).
2. Jan can be in the level 2 class if Kathy is in level one, but she can't be in the level 3 class since there are three students below her, therefore Jan (C).
3. The only candidates are Jan and Kathy since they are the only ones that can be in level 1 but are not definitely in level 1. Since Jan cannot be in level 3 (previous question), we conclude the Kathy can be in all three (C). Indeed, Kathy could be directly under Glen (in level 1), directly under Nick (level 3) or between Jan and Mike (level 2).

4. It's not (A) since Laura could be in either level 2 or 3. It's not (B) since Jan or Kathy can still be in level 1. It's (C) since this forces Mike to be in level 2, Kathy in level 1 and the rest in level 3, thus (C).
5. The answer is Laura and Mike, since if they are in 2 then this forces Jan and Kathy into 1, which cannot be, and if they are in 3 then Hilary and Nick are below them.

1.2 Questions 6-12

The information given gives us the matrix:

	Frank	George	Hilda	Jackie	Karl	Lena
<i>Mystery</i>	N	Y	N			
<i>Retreat</i>		N		N		
<i>Seasonings</i>		N		N		
<i>Wolves</i>		N	N			

and we know that

1. Hilda and Frank review the same film.
2. Lena reviews the same film as exactly one other person.

which implies, together with the other info, that two films are reviewed by two people and the other two films are reviewed by one person.

Answers to Questions:

6. It must be 'Hilda reviews *Retreat*': since Hilda can't review the same film as Lena (because Hilda and Frank review the same one) and Hilda can't review the same as George (for the same reason) it follows that Hilda must review *Retreat*, therefore (A).
7. I'll be using a simplified notation from now on—If Karl reviews *Mystery* then $J=L$ and $H=F$ so either no one reviews *Retreat* or no one reviews *Seasonings*, thus Karl did not review *Mystery*. If Karl reviews *Retreat* then F and H review *Seasonings*, which implies that J reviews *Wolves*. If Karl reviews *Wolves* then L reviews *Mystery* or *Wolves* and so we have the same problem as the first case. Therefore Karl must review *Retreat* which forces Frank and Hilda to review *Seasonings*, so (E).
8. There is no contradiction in assigning any possibility to Lena, therefore (E).
9. (A) no, since this contradicts $H=F$ and the maximum of two reviewers per film; (B) no, for the same reason; (C) no since this would mean $G=J$, $L=K$ and $F=H$ so one movie is left out; (D) no for the same reason as (C); (E) Yes, by elimination, but we can see that this is fine.
10. (A) is fine since no contradiction arises; (B) does not work since then G, K and L all do *Mystery* which contradicts the maximum of two reviewers per film. Therefore (B).

11. If Karl reviews the same movie as anyone else, it must be Lena. They can't both do *Mystery* since G does it and they can't do *Wolves* since then either no one reviews *Retreat* or no one reviews *Seasonings* (Why is this so?), but there is no problem with the other two (Why?) therefore, (C).
12. (A) No, since we know J doesn't do *Seasonings*; (B) No problem. Therefore (B).

1.3 Questions 13-24

13. B
14. D
15. C
16. D
17. E
18. C
19. B
20. C
21. E
22. B
23. D
24. A

Section 1.11 Exercises.

(From Copi, Cohen, *Introduction to Logic*, 10th ed. Prentice Hall, 2002.)

#3. On a certain train, the crew consists of the brakeman, the fireman, and the engineer. Their names listed alphabetically are Jones, Robinson, and Smith. On the train are also three passengers with corresponding names, Mr. Jones, Mr. Robinson, and Mr. Smith. The following facts are known:

- a. Mr. Robinson lives in Detroit.
- b. The brakeman lives halfway between Detroit and Chicago.
- c. Mr. Jones earns exactly \$20,000 a year.
- d. Smith once beat the fireman at billiards.
- e. The brakeman's next-door neighbor, one of the three passengers mentioned, earns exactly three times as much as the brakeman.
- f. The passenger living in Chicago has the same name as the brakeman.

What is the engineer's name?

Solution:

Smith.

Explanation:

- (1) From d) we know that Smith and the fireman are different people.
- (2) From b) and e) we know that the brakeman's neighbor lives between Detroit and Chicago.
- (3) From a) and (2) we know that the brakeman's neighbor is not Mr. Robinson.
- (4) From c) and e) we know that the brakeman's neighbor is not Mr. Jones.
- (5) By elimination, the brakeman's neighbor is Mr. Smith.
- (6) So from b) and (5) we know that Mr. Smith lives between Detroit and Chicago.
- (7) From a) and (6) we know by elimination that Mr. Jones lives in Chicago.
- (8) By f) and (7) we know that the brakeman's name is Jones.
- (9) From (1) and (8) we know that Robinson is the fireman.
- (10) By elimination, Smith is the Engineer.

Hunting for Wild Games

(From *The Best of Logic Puzzles*, Dell Magazines, February 1999, page 7.)

Five shoppers showed up at Games Gazebo in the local shopping mall last Friday. Each customer—Millicent, Naomi, Osgood, Phoebe, and Roscoe—was planning a party during the weekend and was looking for a couple of lively party games to try out on his or her guests. Four new games caught their attention: Banana Gold, Kiss and Tell, Shoes 'N' Socks, and Trivia-Rama. Each customer decided to buy two of these four games. Can you figure out which two each customer bought?

Clues:

Clue 1. At least one copy of each game was sold, but no two games sold the same number of copies.

Clue 2. Shoes 'N' Socks—"the bare feet game"—was one of the two games that Roscoe bought.

Clue 3. Both Millicent and Naomi felt that Trivia-Rama would be too cerebral for their parties.

Clue 4. Osgood, who was holding a reunion for his old army buddies, quickly decided against Kiss and Tell—as did someone else who was giving a birthday party for a strait-laced uncle.

Clue 5. The first customer in line bought Kiss and Tell and Trivia-Rama; the second bought Banana Golf and Trivia-Rama; the third bought Kiss and Tell and Banana Golf.

Solution:

Millicent: Banana Golf, Kiss and Tell Naomi:

Banana Golf, Kiss and Tell Osgood: Banana

Golf, Trivia-Rama Phoebe: Kiss and Tell,

Trivia-Rama Roscoe: Banana Golf, Shoes

'N' Socks.

Explanation:

(1) There are 5 people, and each buy two games. So 10 games are sold. There are four games. Each game is sold at least once. But no two games are sold the same number of times. So we have this: one game sold 1 copy; another game sold 2 copies; a third game sold 3 copies; a fourth game sold 4 copies.

(2) We know that Roscoe bought Shoes 'N' Socks.

(3) We know that Millicent and Naomi did not buy Trivia-Rama. So at most, Trivia-Rama sold 3 copies.

(4) We know that Osgood and someone else did not buy Kiss and Tell. So at most, Kiss and Tell sold 3 copies.

We know the following from Clue 5:

(5) Kiss and Tell sold at least 2 copies

(6) Trivia-Rama sold at least 2 copies

(7) Banana Gold sold at least 2 copies So

we can infer the following:

(8) From the fact that the three other games sold at least 2 copies each, Shoes 'N' Socks sold 1 copy.

(9) So from (3), (6) and (8) we know that Trivia-Rama sold either 2 or 3 copies.

(10) So from (4), (5) and (8) we know that Kiss and Tell sold either 2 or 3 copies.

(11) And so Banana Gold sold 4 copies. So

we can conclude the following:

(12) From (3) and (8), we know that Millicent bought Banana Golf and Kiss and Tell.

(13) Similarly, from (3) and (8), we know that Naomi bought Banana Golf and Kiss and Tell.

(14) From (4) and (8), we know that Osgood bought Banana Golf and Trivia-Rama.

(15) From Clue 5 we know that someone bought Kiss and Tell and Trivia-Rama. From (2), we know this isn't Roscoe. From (12), (13), and (14), we know that it isn't Millicent, Naomi, or Osgood respectively. So it Must be Phoebe.

(16) And so Roscoe must have bought Banana Golf and Shoes 'N' Socks.