CHAPTER – 10

LOGICAL CONNECTIVES

There have been some questions coming in entrance exams based on logical statements and logical connectives. A proper understanding of some basics in Logic will make answering such questions very easy. These questions can be answered easily and very quickly on the basis of some of the basics that we will look at in the following sections. Also, please note that these basics are useful not just for questions asked in CAT but are useful for other varieties of questions that you may come across in other entrance exams as well.

In Logic, we deal with statements that are essentially sentences in the English language. However, in Logic we are not interested in or worried about the factual correctness of the sentence. We are interested only in the Logical "truthfulness" of the statements.

For example, consider the statement:

"If the sun rises in the west, then the moon rises in the north."

Here, we are not concerned with whether the sun rises in the east or west or with the direction in which the moon rises. We will only look at whether the moon will rise in the north or not depending on whether the part of the statement "The sun rises in the west" is true or not. If we are given that the sun rises in the west (which, incidentally, is factually incorrect), we can then conclude that the moon rises in the north (which again does not concern with the direction in which the moon actually rises).

We can represent statements in Logic using symbols like p, q, etc, the way we represent variables/unknowns in Algebra using symbols like x, y, z, etc.

Statements like "I will go for a movie", "It is a sunny day", etc are called simple statements. When two or more such simple statements are connected together to form a single statement, such a statement is called a compound statement.

The simple statements are combined using logical connectives to form compound statements. We should know some of the important logical operators/connectives to be able to effectively tackle questions that involve compound statements and logical operations on compound statements.

Negation ("NOT")

Any statement can be negated by using the words "not" or "no." In layman's language, negation is like the opposite of a statement.

For example, the negation of the statement "It is raining" is "It is NOT raining." The negation of the statement "He will pass the exam" is "He will not pass the exam." This is equivalent to saying "He will fail in the exam." So, when you are looking at negating the given statement, you should keep in mind the English equivalents of the statements also.

Having defined simple statements, we shall now study about a few common operators (also called connectives) that can be used to combine (or operate upon) two or more simple statements and arrive at more complicated or compound statements.

Logical Connective OR

Two or more statements can be connected using the connective OR. The following is an example using OR.

It is raining or I will go to my friend's house.

The same statement can also be written as:

Either it is raining or I will go to my friend's house.

Both the statements above mean the same. The additional word "either" does not change the meaning of the statement.

When two (or more) statements are connected using OR, at least one of them is true.

Suppose we have a statement "Either p or q", since at least one of the two statements p, q must be true, we have p alone is true or q alone is true or both are true.

This is the interpretation to be given to an OR statement (irrespective of the meaning of the sentence as per English language).

For example, the statement "Either I will go for a movie or I will go to my friend's house" means

I will go for a movie
or
I will go to a friend's house
or
I will go both for a movie and to a friend's house.

Let us take the statement "Either he is dead or he is alive."
This statement means
He is alive
or
He is dead
or
He is both alive and dead.

In this case, the possibility "He is both alive and dead" does not make sense if we look at the meaning in English language because a person cannot be dead and alive at the same time. However, as discussed earlier, we will not be concerned about the meaning of the statements.

Hence, we will always interpret the statement "(Either) p or q" as "p alone is true or q alone is true or both are true" (unless otherwise explicitly stated that both are not true at the same time). In other words, in a statement "p or q", we can say that at least one of the two statements is true.

Given "p or q", we get four different possibilities that follow:

(i) Given "p or q", we are then told "p is true":

Since we need at least one of the two statements p or q to be true and here we already know that p is true, we cannot conclude anything about q, that is, we cannot conclude whether q is true or false – both possibilities exist.

(ii) Given "p or q", we are then told "q is true":

Since we need at least one of the two statements p or q to be true and here we already know that q is true, we cannot conclude anything about p, that is, we cannot conclude whether p is true or false – both possibilities exist.

(iii) Given "p or q", we are then told "p is NOT true":

Since we need at least one of the two statements p or q to be true and here we already know that p is not true, q **has** to be true so that at least one of the two statements will then be true. So, here we **can** conclude that **q is true.**

(iv) Given "p or q", we are then told "q is NOT true":

Since we need at least one of the two statements p or q to be true and here we already know that q is not true, p **has** to be true so that at least one of the two statements will then be true. So, here we **can** conclude that **p is true.**

There is one particular category of questions that has appeared in CAT for three years in a row. These questions are based on the concepts that we looked at in the previous section. We will take two or three examples to understand these questions.
The directions of the questions asked were as follows:

"Each question has a main statement followed by four statements labelled A, B, C and D. Choose the ordered pair of statements where the first statement implies the second, and the two statements are logically consistent with the main statement."

Example 1:
Either the elephant is big or the lion is cruel.
a. The elephant is big.
b. The elephant is not big.
c. The lion is cruel.
d. The lion is not cruel.
(A) ac (B) db (C) bc (D) ad

Explanation:

The main statement has two simple statements "The elephant is big" and "The lion is cruel" connected by "OR." Let us call these two statements p and q respectively for the purpose of our discussion. Then the main statement can be represented as "p OR q."

First, let us look at each choice and understand the logic discussed above. Once we do that, we will also see how to answer such questions in a much shorter time.

At least one of these two statements has to be true in any ordered pair we look at. As per the discussion we had above, from among the choices, if we have an ordered pair where the first part of the ordered pair in the choice is one of the two statements true, then we cannot conclude anything about the second part of the ordered pair. However, if the first part of the ordered pair in the choice is not true, then the second part should contain the second statement as given in the main statement (that is, the second statement has to be "true").
Take choice (A) for the above question. The first statement is A which says "The elephant is big." This is p (as we denoted above) which is given in the main statement. Since p is true, we cannot conclude whether q is true or not, i.e., q may be true or it may be false. So, we cannot have any statement following A which can be concluded from A and is consistent with the main statement. Hence, this cannot be the answer choice.

Take choice (B). The first statement is D which says "The lion is not cruel." This is the negation of statement q, that is to say, "Not q" is the first of the two statements in the choice. Since q is negated, p must be true (for at least one of the two statements to be true). But the second statement in this choice is "The elephant is not big" which is "Negation p." Hence, this is not the correct choice.

Take choice (C). The first statement is B which is "The elephant is not big," that is, Negation p. Since p is negated, q must be true (for at least one of the two statements to be true). The second statement in the choice is C which is "The lion is cruel," that is, q. Thus, in this choice, we have Negation p followed by q. So, this is the correct answer choice.

Let us also take a look at choice (D). The first statement in this choice is A, which is "The lion is big," that is p is true. Since the first statement is true, we cannot conclude anything about statement q.

Approach in the exam

In an exam, for these types of questions, we do not need to go from the answer choices and check each and every one of them. We can directly identify the correct combinations of statements that will satisfy the directions given.

We know that if the first statement out of the two statements in the choice is either p or q (that is one of the two statements given in the question), then we cannot draw any conclusion.

We also know that if p or q is negated, then the other statement should definitely be true. So, "Negation p followed by q" and "Negation q followed by p" will be correct combination of statements. Hence, we directly check out for NOT p ➔ q or NOT q ➔ p in the answer choices.

In the above example, we should look for BC or DA.

Logical Connective AND

Two or more statements can be connected using the connective AND. The following is an example using AND.

It is raining **and** I will go to my friend's house.

The two statements connected by **and** have to be true for the compound statement to be true. In general, if we have a statement "p and q", then we can conclude that p should be true as well as q, that is, both the statements should be true. Even if one of the two statements is false, the compound statement is false.

Negation of compound statements formed with OR, AND

A compound statement formed with OR or AND can be negated in the following manner:
"Negation (p OR q)" is the same as "Negation p AND Negation q."

"Negation (p AND q)" is the same as "Negation p OR Negation q."

As can be seen in the above example, when a compound statement consisting of two simple statements (connected with OR or AND) is negated, the result will consist of each of the individual statements negated. In addition to that, the following will also have to be observed:

OR will become AND

AND will become OR

Logical connective IF-THEN

This is a very important connective. This is represented by p ➔ q (and is read as "p implies q"). This means that if we know that p has occurred, q has to occur or must have occurred. For example, the statement "If it is raining, then I wear a raincoat" means that if we know that it is raining, we can conclude that I must be wearing a raincoat.

The statement "p implies q" is called an implication statement. The term on the left hand side in p ➔ q is called the "antecedent" and the term q is called the "consequent".

Let us look at the following cases when we are given that p ➔ q.

(i) Given that p ➔ q, we are then told that q has occurred. Can we conclude that p must have occurred?

We cannot conclude that p must have occurred. This is because while whenever p occurs, q will definitely occur, q may occur even otherwise, that is, even without the occurrence of p. So, both p and Negation p are possible and hence, we cannot conclude anything when we know that q has occurred.

(ii) Given that p ➔ q, we are then told that p has not occurred. Can we conclude that q will also not occur?

We cannot conclude that q will not occur. This is because while whenever p occurs, q will definitely occur, q may occur even when p does not occur (as discussed above). So, both q and Negation q are possible, and hence we cannot conclude anything when we know that p has not occurred.

(iii) Given that p ➔ q, we are then told that q has not occurred. Can we conclude that p must not have occurred?

We can conclude that p must not have occurred. This is because had p occurred, q would have occurred. But we know that q has not occurred, so p must not have occurred. So, we can conclude that "Negation p" follows "Negation q."

So, if we are given that p ➔ q, then "Negation q ➔ Negation p." This is a very important relationship. We can express it in words as

"In an implication statement, negation of the right hand side will always imply the negation of the left hand side."
We can summarise the above three points as follows:

p ➔ q	Given
q ➔ p q ➔ Negation p	Cannot be concluded Cannot be concluded
Negation p ➔ Negation q Negation p ➔ q	Cannot be concluded Cannot be concluded
Negation q ➔ Negation p	Is always true

In certain CAT papers, there were questions on "if—then" concepts discussed above – questions similar to those on Either—or that we looked at above. Let us take an example and understand these questions. The directions are the same as that we looked at above:

"Each question has a main statement followed by four statements labelled A, B, C and D. Choose the ordered pair of statements where the first statement implies the second, and the two statements are logically consistent with the main statement."

Example 2:
If the elephant is big, then the lion is cruel.
a. The elephant is big.
b. The elephant is not big.
c. The lion is cruel.
d. The lion is not cruel.
(A) ca (B) bd (C) bc (D) db

Explanation:

The main statement has two simple statements "The elephant is big" and "The lion is cruel" connected by "IF—THEN." Let us call these two statements p and q respectively for the purpose of our discussion. Then the main statement can be represented as "p implies q" or "p➔q".

First, let us look at each choice and understand the logic discussed above. Once we do that, we will also see how to answer such questions in a much shorter time.

Take choice (A). In terms of p and q, this can be represented as q➔p. As per the table above, we know that this cannot be concluded, given p➔q. Hence, this is not the correct answer.

Take choice (B). In terms of p and q, this can be represented as "Negation p ➔ Negation q". Again, as per the table above, we know that this cannot be concluded, given p ➔ q. Hence, this is not the correct answer.

Take choice (C). In terms of p and q, this can be represented as "Negation p ➔ q", As per the table above, we know that this cannot be concluded, given p ➔ q. Hence, this is not the correct answer.

Since we eliminated three answer choices, the fourth has to be the correct answer. Let us take choice (D) and look at it. In terms of p and q, it can be represented as "Negation q ➔ Negation p". As per the table above, we know that this can definitely be concluded. Hence, this is the correct answer choice.

Approach in the exam

In an exam, for these types of questions, we do not need to go from the answer choices and check each and every one of them. We can directly identify the combinations of statements that will satisfy the directions given.
Given that p ➔ q, we know that "Negation q ➔ Negation p".
Hence, the two correct combinations are p ➔ q (because this is the given statement itself) and "Negation q ➔ Negation p."
So, in the above example, we should look for ac or db. Hence, the correct answer is choice (D).

Other forms of IF-THEN

There are different types of statements which can be reduced to or represented as p➔q. Let us look at these statements in descriptive form and the representation by using "➔" sign.

S. No.	Statement	Representation using ➔	Also equivalent to	Remarks
1.	If p, then q	p ➔ q	Neg. q ➔ Neg. p	Already discussed above
2.	q, if p	p ➔ q	Neg. q ➔ Neg. p	Identical to 1 above
3.	When p, then q Whenever p, then q	p ➔ q	Neg. q ➔ Neg. p	Identical to "if p, then q"
4.	q, when p q, whenever p	p ➔ q	Neg. q ➔ Neg. p	Same as 3 above
5.	Everytime p, q	p ➔ q	Neg. q ➔ Neg. p	Same as "If p, then q"
6	q, everytime p	p ➔ q	Neg. q ➔ Neg. p	Same as 5 above
7.	q, only if p	q ➔ p	Neg. p ➔ Neg. q	
8.	Unless p, q	Negation p ➔ q	Neg. q ➔ p	
9.	q, unless p	Negation p ➔ q	Neg. q ➔ p	Same as 8 above
10.	p, otherwise q	Negation p ➔ q	Neg. q ➔ p	Same as "Unless p, q"

Another model of questions:

There is one particular model of questions that appeared in the XAT exam in the recent past. These questions are based on the logic that has been discussed above. We will take an example and see how to solve such questions.

Directions: Each question below consists of a main statement followed by four statements. From the choices, select the one that is logically consistent with the main statement.

(Please note that the directions, instead of asking you to find out the choice that is "logically consistent with the main statement", may ask you to find out the choice that is "logically equivalent to the main statement" or "Which of the following statements is true?")

Example 3:
If it is raining, then I will go for a movie or I will visit my friend's house.
(A) It is not raining, means that I will not go for a movie or I will not visit my friend's house.
(B) It is not raining, means that I will not go for a movie and I will not visit my friend's house.
(C) I will not go for a movie or I will not visit my friend's house, means that it is not raining.
(D) I will not go for a movie and I will not visit my friend's house, means that it is not raining.

Explanation:

Solving this question involves the application of simple concepts/rules about IF—THEN, OR, AND and NEGATION which we have already looked at.
Let us use symbols like p, q to denote the simple statements in the main statement given and represent the main statement as well as the choices with these symbols connected with logical connectives like OR, NOT and IF.

Let us denote
"It is raining" by p
"I will go for a movie" by q
and "I will visit my friend's house" by r

Then, the main statement will read as
p ➔ q OR r

The choices can be represented as:

(A) Negation p ➔ Negation q OR Negation r
(B) Negation p ➔ Negation q AND Negation r
(C) Negation q OR Negation r ➔ Negation p
(D) Negation q AND Negation r ➔ Negation p

Let us take the main statement p ➔ q OR r. We know that in any implication statement, the negation of the right hand side will imply the negation of the left hand side. That is, we can write
Negation (q OR r) ➔ Negation p

We also know that negation of a compound statement formed by two simple statements combined by an OR will be equal to the negation of the two individual statements combined by an AND. By applying this principle to the left hand side of the above statements, we have

Negation q AND Negation r ➔ Negation P

This, we find is the same as choice (D). Hence, choice (D) is the correct answer.

Exercise – 10(a)

Directions for questions 1 to 5: In each question, there is a main statement followed by four statements (a), (b), (c) and (d). From the choices, choose the ordered pair where the first statement implies the second statement and the two are logically consistent with the main statement.

1. Swati would be selected in the first company, if she has an excellent academic record.
(a) Swati is selected in the first company.
(b) Swati is not selected in the first company.
(c) Swati has an excellent academic career.
(d) Swati does not have an excellent academic record.

(A) ac (B) bd (C) db (D) ad

2. Only if Abhijeet has good knowledge in classical music, he would be elected as Musical Idol.
(a) Abhijeet does not have good knowledge in classical music.
(b) Abhijeet is elected as Musical Idol.
(c) Abhijeet is not elected as Musical Idol.
(d) Abhijeet has good knowledge in classical music.

(A) ca (B) db (C) bd (D) ba

3. Unless the Indian government seals the borders illegal migration in India will not stop.
(a) Indian government sealed the border.
(b) Illegal migration in India stopped.
(c) Indian government had not sealed the borders.
(d) Illegal migration in India will not stop.

(A) cd (B) ab (C) cb (D) ad

4. Whenever Sandeep receives a message from Sangeeta, he seems to be on cloud nine.
(a) Sandeep did not receive a message from Sangeeta.
(b) Sandeep is on cloud nine.
(c) Sandeep is not on cloud nine.
(d) Sandeep received a message from Sangeeta.

(A) ba (B) bd (C) cd (D) ca

5. If the inflation is high the GDP will touch a record low.
(a) The inflation is high.
(b) The inflation is not high.
(c) The GDP will touch a record low.
(d) The GDP will not touch a record low.

(A) cb (B) ad (C) ca (D) db

Directions for questions 6 to 15: Each question given below is a statement followed by four different statements. Choose the one which is the correct negation of the given statement.

6. Either Anand will marry Vandana or Madhavi will marry Kollol.
(A) Anand does not marry Vandana, so Madhavi marries Kollol.
(B) Neither Anand marries Vandana nor Madhavi marries Kollol.
(C) Madhavi does not marry Kollol but Anand marries Vandana.
(D) None of these

7. Whenever Bhiru and Basanti go for long drive, Joy follows them.
(A) Joy follows Bhiru and Basanti but they are not going for a long drive.
(B) Bhiru and Basanti are going for long drive and Joy follows them.
(C) Joy does not follow Bhiru and Basanti even when they go for long drive.
(D) None of these

8. Pratap Rana will attend the class, only if his father allows him to go by bike.
(A) Pratap Rana is not attending the classes even his father allows him to come by bike.
(B) Pratap Rana's father did not allow him to go by bike but he was attending the class.
(C) Pratap Rana is not attending the classes because his father did not allow him to go on bike.
(D) None of these

9. Unless Aiswariya plays the role of Paro, Madhuri will not play the role of Chandramukhi.
(A) Madhuri is not playing the role of Chandramukhi, but Aiswariya is playing the role of Paro.
(B) Aiswariya is playing the role of Paro, Madhuri is acting the role of Chandramukhi.
(C) Madhuri is playing the role of Chandramukhi but Aiswariya is not playing the role of 'Paro'.
(D) None of these

10. Unless the change happens, the problem will not be solved.
(A) The problem is solved and the change did not happen.
(B) The change happened but the problem is not solved.
(C) The change happened and the problem is solved.
(D) The problem is solved implies, the change happened.

11. The presentation was lengthy but simple.
(A) The presentation was not lengthy and not simple.
(B) The presentation was lengthy but not simple.
(C) The presentation was not lengthy or not simple.
(D) The presentation was simple but not lengthy.

12. Unless Tarun learns the basics, he cannot solve connectives.
(A) Tarun learned the basics but he could not solve connectives.
(B) Tarun did not learn the basics, but he could solve connectives.
(C) Tarun learned basics and solved connectives.
(D) Tarun did not learn basics and he did not solve connectives.

13. He either goes to US or he will join in a job.
(A) He went to US and did not join in a job.
(B) He went to US but joined in a job.
(C) He did not go to US and joined in a job.
(D) He did not go to US and did not join in a job.

14. If you share your sorrow with your friends, you will be happy.
(A) You did not share your sorrow with your friends and you are happy.
(B) You shared your sorrow with your friends but you are not happy.

(C) You did not share your sorrow with your friends and you are not happy.
(D) You shared your sorrow with your friends so you are happy.

15. Every mind works at its best, only if it is open.
(A) Mind worked at its best when it is open.
(B) Mind did not work at its best because it is not open
(C) Mind worked at its best even though it is not open.
(D) Mind did not work at its best even when it is open.

Directions for questions 16 to 25: Each question below consists of a main statement followed by four numbered statements. From the numbered statements, select the one that logically follows the main statement.

16. If it is a Sunday, then I will go to a movie or I will read a novel.
(A) It is not a Sunday, implies that I am not going to a movie and I am not reading a novel.
(B) It is a Sunday and I am not reading a novel means that, I am watching a movie.
(C) I am not watching a movie and I am reading a novel, means that it is a Sunday.
(D) None of these

17. Unless Sangeeta's boss sanctions her leave and books the tickets, Sangeeta cannot go home for Diwali.
(A) Sangeeta is going home for Dipawali, hence, her boss booked her tickets but did not sanction leave.
(B) Sangeeta is going home for Dipawali, implies that her boss sanctioned leave but the tockets are not booked.
(C) Sangeeta's ticket was not booked implies, she is not going home for Diwali.
(D) More than one of the above

18. If Meera is dynamic or creative, she will be ahead in the competition.
(A) Meera is dynamic implies that she will be ahead in the competition.
(B) Meera is creative means, she will be ahead in the competition.
(C) Meera is not ahead in the competition means that she is neither creative nor dynamic.
(D) All of the above

19. If the number of retail outlets is increased, then the prices will decrease or the consumption will increase.
(A) The prices did not decrease or the consumption did not increase implies that the number of retail outlets is not increased.
(B) The number of retail outlets is not increased means that the prices will not decrease and the consumption will not increase.
(C) The prices decreased or the consumption increased means that the number of retail outlets was increased.
(D) The prices did not decrease and the consumption did not increase implies that the number of retail outlets is not increased.

20. Unless you return from the planet in less than a week, you will be affected by radiation and the mental health will deteriorate.
(A) You did not return from the planet in less than a week, you will be affected by radiation and the mental health will deteriorate.
(B) You are not affected by radiation or your mental health did not detiorate, implies that you did not return from the planet in less than a week.
(C) You are affected by radiation and your mental health detiorated implies that you did not return from the planet in less than a week.
(D) You are not affected by radiation and your mental health detiorated, means that you returned from the planet in less than a week.

21. If the teacher is in the class, then the children will either read or keep quiet.
(A) The children will not read or will not keep quiet, implies that the teacher is not in the class.
(B) If the teacher is not in the class, then the children will not read and will not keep quiet.
(C) The children will not read and will not keep quiet, implies that the teacher is not in the class.
(D) If the teacher is not in the class, then the children will not keep quiet or will not read.

22. Whenever an earthquake occurs, either a tsunami or a volcanic eruption takes place.
(A) If a volcanic eruption or a tsunami takes place, then an earthquake must have occurred.
(B) If a volcanic eruption did not occur and a tsunami did not occur, then an earthquake did not occur.
(C) If an earthquake does not occur, neither a tsunami nor a volcanic eruption takes place.
(D) If earthquake occurs and volcanic eruption takes place, then tsunami does not occur.

23. Whenever India plays Pakistan, I will either bite my nails or my BP rises.
(A) India is not playing Pakistan, means that I will neither bite my nails nor my BP does rise.
(B) I am biting my nails or my BP rises, implies that India is playing Pakistan.
(C) I am not biting my nails or my BP did not rise, means that India is not playing Pakistan.
(D) If India is playing Pakistan but my BP is not rising, means that I must be biting my nails.

24. If it is a holiday, then I will draw the curtains and sleep all day.
(A) I did not draw the curtains or I did not sleep all day, means that it was not a holiday.
(B) It is not a holiday, means that I will not draw the curtains and I will not sleep all day.
(C) I did not draw the curtains and I did not sleep all day, means that it was not a holiday.
(D) I have drawn the curtains and I slept all day, means that it was a holiday.

25. Whenever pollution is on the rise, vehicles will be stopped and their emission levels will be checked.
(A) Vehicles are not stopped or their emission levels are not checked, means that the pollution is not on the rise.
(B) If vehicles are not stopped but pollution is on the rise, then the emission levels of vehicles will definitely be checked.
(C) If vehicles are stopped but their emission levels are not checked, it means that the pollution is not on the rise.
(D) Both (A) and (C) above

Directions for questions 26 to 30: Select the correct alternative from the given choices.

26. If Ali has good knowledge of JAVA, he will be selected in Satyam Computers. Unless Ali is not selected in Satyam Computers, he will not be selected in CTS.
Ali is selected in CTS implies that
(A) Ali has good knowledge in JAVA.
(B) Ali is selected in Satyam Computers.
(C) Ali does not have good knowledge of JAVA.
(D) None of these

27. The H.R. manager of TCS will come, if the strike does not effect the flight timings. Only if the HR manager of TCS comes, TCS will recruit people.
TCS is recruiting people implies that
(A) the strike effects the flight timings.
(B) the strike does not effect the flight timings.
(C) the HR manager of TCS does not come.
(D) None of these

28. Unless the coding is not tested, the company can implement it. If the company can implement the coding, the network system will work properly.
The network is not working properly, implies that
(A) the coding is tested.
(B) the coding is not tested.
(C) the company implement the coding
(D) None of these

29. When the Infosys team's performance is excellent, then Infosys will become the top IT company. Either Infosys does not become the top IT company or TCS remains in the top rank.
The Infosys team's performance is excellent, means that
(A) TCS remains in the top rank.
(B) TCS will not remain in the top rank.
(C) Infosys will be in the top rank.
(D) None of these

30. If a person follows the conventional methods, he cannot be successful. Unless a person is successful, he cannot be a part of successful company.
Mr. Prasad has become a part of P & G, a successful company. Hence, it can be concluded that
(A) Mr. Prasad is not successful.
(B) Mr. Prasad follows conventional methods.
(C) Mr. Prasad does not follow conventional methods.
(D) None of these

Exercise – 10(b)

Directions for questions 1 to 5: Each question below consists of a main statement followed by four statements as answer choices. From among the choices, select the one that logically follows the main statement.

1. If I am not paid, I will not work and I will not take leave.
(A) If I have worked and I took leave, then I am paid.
(B) If I have worked and I have not taken leave, then I was paid.
(C) If I have worked or I have taken leave, then I was paid.
(D) More than one of the above.

2. If Rama leaves Ayodhya, then he will go to forest or to Sri Lanka.
(A) Rama did not go to forest and did not go to Sri Lanka, implies that he did not leave Ayodhya.
(B) Rama did not leave Ayodhya, implies that he will not go to forest or will not go to Sri Lanka.
(C) Rama went to forest or to Sri Lanka, implies that he did not leave Ayodhya.
(D) Rama did not leave Ayodhya, implies that he will not go to forest and will not go to Sri Lanka.

3. Unless the party gets a majority, the house will be dissolved and the President's rule will be imposed.
(A) The party got a majority, it means that either the house will not be dissolved or the President's rule will not be imposed.
(B) The house is not dissolved or the President's rule is not imposed, means that the party got a majority.
(C) The house is not dissolved and the President's rule is not imposed, means that the party got a majority.
(D) Both (B) and (C).

4. If you plant trees, then there will be no pollution and you get fruits.
(A) If there is no pollution and you did not get fruits, then you planted trees.
(B) If there is pollution and you did not get fruits, then you did not plant trees.
(C) If there is pollution or you did not get fruits, then you did not plant trees.
(D) Both (B) and (C)

5. If there is no traffic, then I will not drive slow but I will go on a long drive.
(A) If there is traffic, then I will drive slow but I will not go on a long drive.
(B) If there is traffic, then I will not drive slow but I will not go on a long drive.
(C) If I drive slow or I do not go on a long drive, it means that there is traffic.
(D) If I did not drive slow and I went on a long drive, it means that there is traffic.

Directions for questions 6 to 21: Each question has a main statement followed by four statements labelled a, b, c and d. Choose the ordered pair of statements where the first statement implies the second, and the two statements are logically consistent with the main statement.

6. If the desert is vast, then the ocean is hollow.
(a) The desert is vast.
(b) The desert is not vast.
(c) The ocean is hollow.
(d) The ocean is not hollow.

(A) ca (B) bd (C) bc (D) db

7. If the bird flies, then the fly swims.
(a) The bird did not fly.
(b) The fly did not swim.
(c) The bird flew.
(d) The fly swam.

(A) ca and db (B) bc and ba
(C) ba and cd (D) ab and dc

8. If the hut is tall, then the skyscraper is short.
(a) The hut is tall.
(b) The hut is not tall.
(c) The skyscraper is short.
(d) The skyscraper is not short.

(A) ca (B) bd (C) bc (D) db

9. If the bowler can bat, then the captain cannot bat.
(a) The bowler cannot bat.
(b) The captain cannot bat.
(c) The bowler can bat.
(d) The captain can bat.

(A) cb and da (B) ba and cd
(C) Only cb (4) Only ba

10. The umpire gives a break, only if the audience get bored.
(a) The umpire gave a break.
(b) The umpire did not give a break.
(c) The audience do not get bored.
(d) The audience got bored.

(A) cd (B) ad (C) bc (D) db

11. The Titan is cold, if the Moon is hot.
(a) The Titan is not cold.
(b) The Moon is hot.
(c) The Titan is cold.
(d) The Moon is not hot.

(A) ca (B) ad (C) cb (D) da

12. Whenever the employees want a hike, they go on strike.
(a) The employees do not want a hike.
(b) The employees want a hike.
(c) The employees went on strike.
(d) The employees did not go on strike.

(A) cb (B) bd (C) da (D) db

13. The inflation does not fall, if the prices do not fall.
(a) The inflation fell.
(b) The inflation did not fall.
(c) The prices did not fall.
(d) The prices fell.

(A) ca (B) bd (C) bc (D) ad

14. Unless the farmer ploughs the land, the crop will not grow.
(a) The farmer ploughed the land.
(b) The crop grew.
(c) The farmer did not plough the land.
(d) The crop will not grow.

(A) cd (B) ab (C) bc (D) da

15. Unless the sun sets, the moon does not rise.
(a) The moon rises.
(b) The sun sets.
(c) The moon does not rise.
(d) The sun did not set.

(A) ad (B) cd (C) cb (D) ab

16. Either the thief is not busy or the police is not active.
(a) The thief is not busy.
(b) The police is active.
(c) The police is not active.
(d) The thief is busy.

(A) cd (B) ba (C) bd (D) ac

17. Either the dog is not barking or the donkey is braying.
(a) The dog is barking.
(b) The dog is not barking.
(c) The donkey is braying.
(d) The donkey is not braying.

(A) ac (B) ca (C) cb (D) ad

18. Either the helmet is heavy or the belt is not tight.
(a) The helmet is heavy.
(b) The helmet is not heavy.
(c) The belt is tight.
(d) The belt is not tight.

(A) ac (B) ca (C) cb (D) ad

19. Either they use the computer or they use the Abacus.
(a) They use the computer.
(b) They do not use Abacus.
(c) They do not use the computer.
(d) They use Abacus.

(A) ab (B) ba (C) dc (D) ad

20. Either he catches the snake or he catches the mangoes.
(a) He caught the snake.
(b) He did not catch the mangoes.
(c) He caught the mangoes.
(d) He did not catch the snake.

(A) ab and cd (B) ac alone
(C) dc alone (D) ba and dc

21. Either the wind is strong or the building is weak.
(a) The building is weak.
(b) The wind is not strong.
(c) The building is not weak.
(d) The wind is strong.

(A) ad and cb (B) dc and ba
(C) ab and cd (D) cd and ba

Directions for questions 22 to 28: Each question below consists of a statement followed by four numbered statements as answer choices. From among the choices, select the one that logically negates the main statement.

22. Bhavya reads aloud, if her friends are not there.
(A) Bhavya is not reading aloud and her friends are there.
(B) Bhavya's friends are there and she is reading aloud.
(C) Bhavya is not reading aloud and her friends are not there.
(D) Bhavya is reading aloud and her friends are not there.

23. Sourav goes in, whenever Dravid comes back.
(A) Sourav went in and Dravid did not come back.
(B) Sourav did not go in and Dravid did not come back.
(C) Sourav did not go in and Dravid came back.
(D) Sourav goes in and Dravid comes back.

24. Either the batsman is out or the decision is wrong.
(A) The batsman is not out and the decision is wrong.
(B) The decision is not wrong and the batsman is not out.
(C) The batsman is out and the decision is not wrong.
(D) The decision is not wrong and the batsman is out.

25. The boy plays, unless he is hungry.
(A) The boy is hungry and he does not play.
(B) The boy is playing and he is not hungry.
(C) The boy is hungry and he is playing.
(D) The boy is not playing and he is not hungry.

26. The plant will grow, only if the soil is fertile and it has water.
(A) The plant did not grow and the soil is neither fertile nor it has water.
(B) The plant grew and the soil is not fertile or it has no water.
(C) The soil is fertile and it has water and the plant did not grow.
(D) The plant grew, the soil is fertile and it has water.

27. Sailaja went to watch movie and she had ice-cream.
(A) Sailaja did not go to watch movie but she had ice-cream.
(B) Sailaja went to watch movie but she did not have ice-cream.
(C) Sailaja neither went to watch a movie nor she had ice-cream.
(D) Sailaja did not go to watch movie or did not have ice-cream.

28. Sraddha will complete the work by Saturday only if she gets leave from Monday.
(A) Sraddha completed the work by Saturday and she did not get leave from Monday.
(B) Sraddha did not complete the work by Saturday and she did not get leave from Monday.
(C) Sraddha did not complete the work by Saturday and she got leave from Monday.
(D) Both (A) and (B)

Directions for questions 29 and 30: Each question consists of a set of statements in alphabetical order. Assume that each one of these statements is individually true. Each of the four choices consists of a subset of these statements. Choose the subset as your answer where the statements therein are logically consistent among themselves.

29. (a) Only if the water level in the coastal areas rises, then the people change their life style.
(b) People change their life style only if they are rewarded.
(c) If people are rewarded, then they will not change their life style.
(d) If the temperatures rises, then the water level in the coastal areas rises.
(e) Whenever the water level in the coastal areas rises, then the temperature rises.
(f) Unless the people change their life style, temperature rises.
(g) People are rewarded.
(h) Water level in the coastal area does not rise.
(A) c, d, f, g and h (B) g, f, d, b and h
(C) a, c, d, g and h (D) e, f, g, h and b

30. (a) If Gulam sings, then audience sleep.
(b) If Gulam sings, then audience dance.
(c) Unless audience do not dance, the concert will be successful.
(d) Only if audience dance, the concert will be successful.
(e) If Vani dances, then Gulam sings.
(f) Gulam sings, only if Vani dances.
(g) Vani dances.
(h) The concert is successful.
(A) c, f, g, b and h (B) a, c, f, g and h
(C) e, c, g, b and h (D) d, f, g, h and b

Key

Exercise – 10(a)

1.	B	6.	B	11.	C	16.	B	21.	C	26.	C
2.	C	7.	C	12.	B	17.	C	22.	B	27.	D
3.	A	8.	B	13.	D	18.	D	23.	D	28.	B
4.	D	9.	B	14.	B	19.	D	24.	A	29.	A
5.	D	10.	A	15.	C	20.	A	25.	D	30.	C

Exercise – 10(b)

1.	D	6.	D	11.	B	16.	B	21.	D	26.	B
2.	A	7.	C	12.	C	17.	A	22.	C	27.	D
3.	D	8.	D	13.	D	18.	B	23.	C	28.	A
4.	D	9.	A	14.	A	19.	B	24.	B	29.	B
5.	C	10.	B	15.	D	20.	D	25.	D	30.	C