SYLLOGISM

Syllogism is a form of deductive reasoning that uses two premises to reach a logical conclusion. It is a fundamental tool in logic and critical thinking, developed by the ancient Greek philosopher Aristotle. Syllogisms are built upon categorical propositions, which are statements that assert or deny the relationship between two categories or classes.

A syllogism consists of three parts: two premises and a conclusion.

The **premises** are statements that provide information or evidence, while the **conclusion** is the logical inference drawn from the premises. Each premise and the conclusion contain two categorical terms and a middle term that connects them.

Consider these three statements:

1. Jack is an Indian. ⇒ **Premise 1**
2. **All Indian are Smart.** ⇒ **Premise 2**
3. Jack is Smart. ⇒ **Conclusion**

In the above example the first two statements represent Premises i.e., Premise 1 and Premise 2, while the last statement represents a conclusion.

TYPES OF PREMISES:

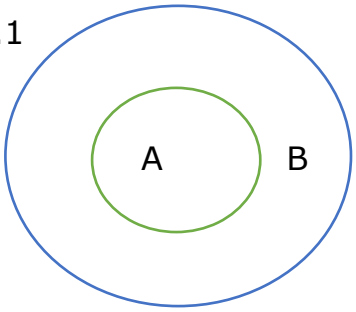
We can categorise the premises in two ways, one as Universal and particular and the other as Affirmative and Negative.

	Affirmative	**Negative**
Universal	All A are B	No A are B
Particular	Some A are B	Some A are not B

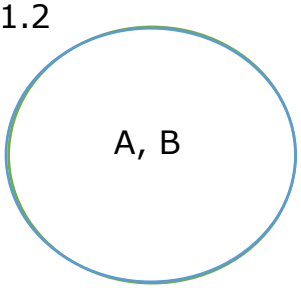
Let's discuss about these premises one by one as four cases:

Case 1: All A are B.

1.1



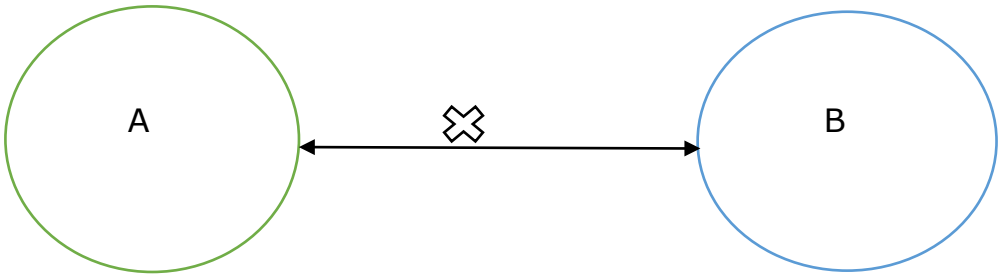
1.2



Important Observations:

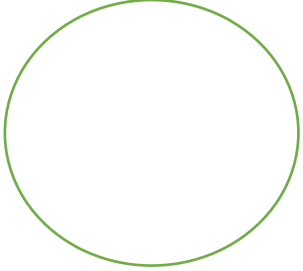
- Set A is a subset of Set B.
- Can't infer that there are some elements in Set B that are not in Set A.
- It's different from "All Bare A".

Case 2: No A are B.



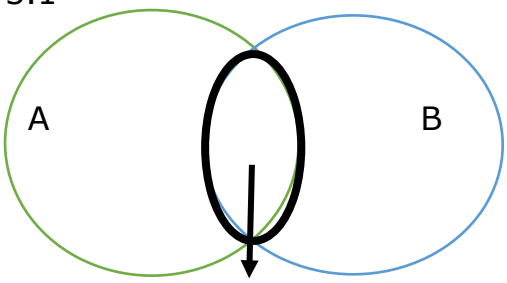
Important Observations:

- The two sets, A and B, do not overlap.
- It is same as No B are A.
- It can also be written in the form "All A are not B".



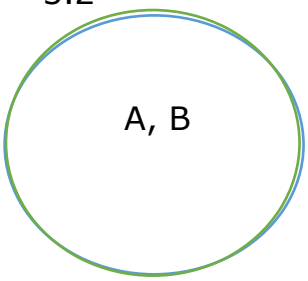
Case 3: SomeA are B.

3.1

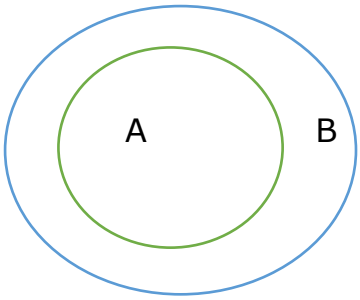


Can’t be empty

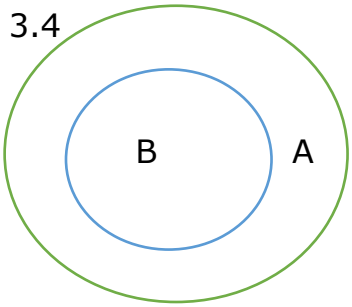
3.2



3.3



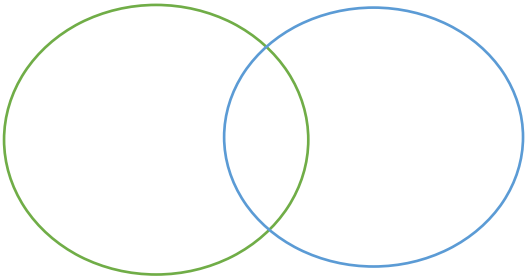
3.4



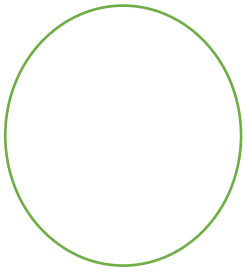
Important Observations:

- There is at least one element that is both in Set A and Set B.
- Can’t infer that “Some A are not B”.
- It’s same as the “Some B are A”.

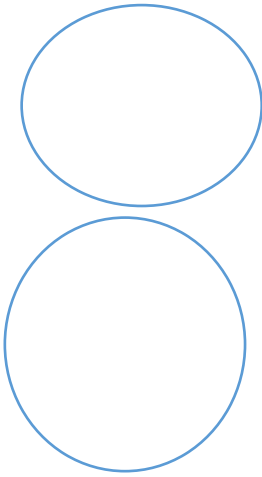
Case 4: SomeA are not B.



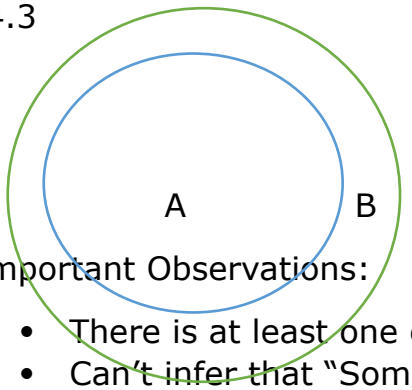
4.1



4.2



4.3



Important Observations:

- There is at least one element in Set A that is not in Set B.
- Can't infer that "Some A are B".
- It's different from "Some B are not A".

Concept of Minimum Overlap:

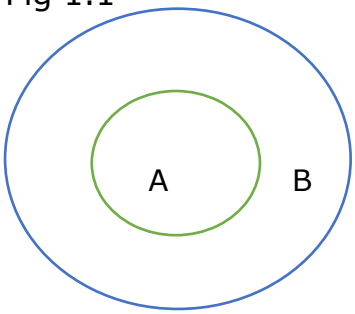
The term "minimum overlap" refers to the principle that the circles should overlap as little as possible to accurately represent the relationships between the terms. The goal is to minimize the overlap to ensure that the diagram does not include any unnecessary inferences or assumptions.

By using a minimum overlap diagram, you can visually analyse the validity of a syllogism and determine if the conclusion logically follows from the given premises. The diagram helps to identify any potential fallacies or errors in reasoning by examining the relationships between the classes or categories represented by the circles.

For instance:

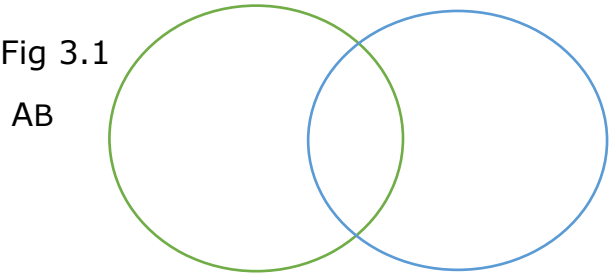
For All are B, we can create two Venn diagram to show the relationship, but if you analyse the two diagrams, you will realise the fig 1.1 follows the principle of MOD.

Fig 1.1



Likewise, for Some A are B, there can be four possible Venn diagrams out of which fig 3.1 satisfies the condition of MOD.

Fig 3.1



1. Statements:

    1. Some A are B.
    2. Some B are C.
    3. Some C are D.

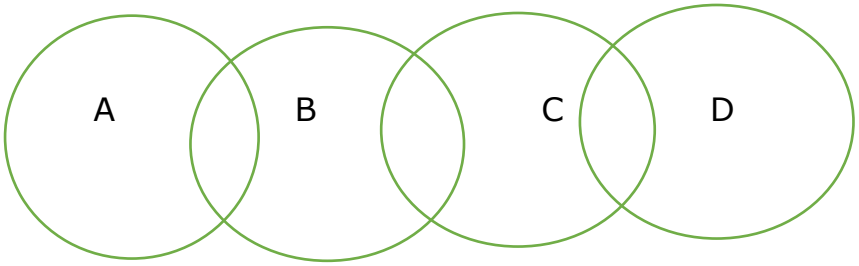
Conclusions:

    1. All A are D.
    2. Some C are A.
    3. Some B are D.

Mark answer option as:

    a. If only 1 follows
    b. If only 2 follows
    c. If both 1 and 3 follow
    d. None follows

Use all the three statements above to draw MOD first:



If we look at all the conclusions carefully, they all are affirmative in nature. And its actually very easy to check conclusions which are affirmative or positive in nature. All we need to do is we have to check whether the given affirmative conclusion is visible in the MOD or not. If its visible then the conclusion will follow otherwise the conclusion will not follow.

Read conclusion 1, All A are D, if you check the given conclusion against MOD the required overlap is not visible in the MOD and therefore Conclusion 1 doesn't follow.

Likewise check Conclusion 2 and Conclusion 3, Some C are A and Some B are D, the required overlap for the conclusions is not visible and therefore they do not follow.

Answer option (d): None Follows.

2. Statements:

    1. All Ants are Bulls.
    2. Some Bulls are Cars.
    3. All Donkey are Cars.

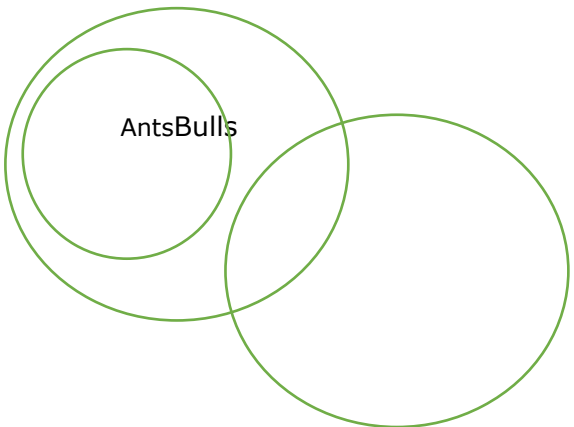
    Conclusions:

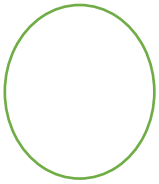
    1. Some Cars are Ants.
    2. No Cars are Ants.
    3. Some Bulls are not Cars.

    Mark answer option as:

    a. If only 1 follows
    b. If only 2 follows
    c. If both 1 and 3 follow
    d. None follows.

MOD:



DonkeysCars 

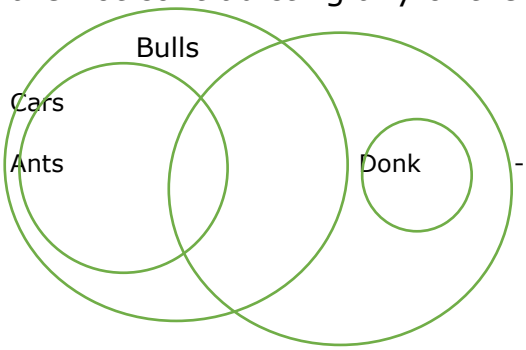
If you read the three conclusions carefully, you will realise except conclusion 1, the remaining two conclusions are negative in nature. To check negative conclusion will change the methodology but before that let's check conclusion 1 first as it affirmative in nature.

Conclusion 1 reads, Some Cars are Ants, as the required overlap is not visible in the MOD and therefore it doesn't follow.

For checking negative conclusions, we have to change the methodology a little bit, to check a negative conclusion of type "No A are B" will check it through its complementary pair i.e. "Some A are B".

No Cars are Ants -→ Some Cars can be Ants.

Some Cars can be Ants, is a possibility type statement, and therefore we need to check it through a possible diagram other than MOD. While drawing possible diagram we are allowed to do any changes as long as we are not contradicting any of the statements i.e., premises.

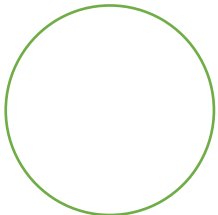


-→Possible Diagram

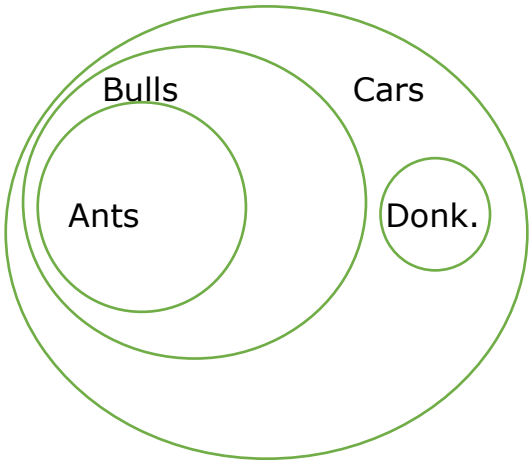
Since its possible to show Cars as Ants without contradicting any of the statements therefore No Cars are Ants doesn't follow.

To check a negative conclusion of type "Some A are not B" will use the complementary pair "All A are B".

Some Bulls are not Cars --→All Bulls can be Cars



All Bulls can be Cars, is also a possibility type statement, and therefore we use possible diagram.



-→ Possible Diagram

Again,it's possible to show All Bulls as Cars therefore, Some Bulls are not Cars doesn't follow.

Answer option (d), as no conclusion follows.

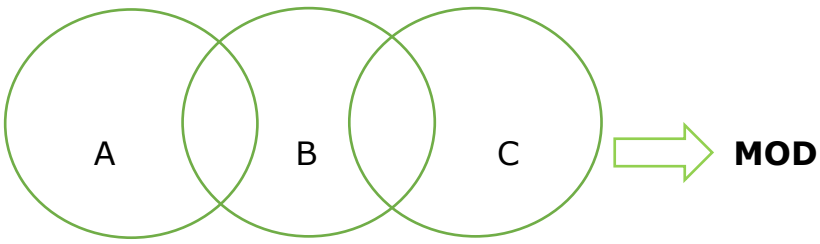
Case of Either-Or:

To understand the Either-or case, consider following statements.

Some A are B.

Some B are C.

Some C are D.



Let's check some conclusions against the Venn diagram.

1. Some A are C
2. No A are C
3. Some A are not C.
4. All A are C.

If we check all the conclusion separately by using the discussed methodologies, none of the conclusion will follow. But there is a catch, if we see the first two conclusion together, they can be wrong at the same time. If we say that Some A are B doesn't follow, then No A are B will follow or vice versa and therefore only one of the two will follow at the same time and we should apply either or in this case.

Likewise, if we consider the last two conclusions together, both statements cannot be wrong at the same time. If we say that Some A are B doesn't follow, then All A are B will follow or vice versa and therefore only one of the two will follow at the same time and we should apply either or in this case as well.

To make things easier we can follow some rules before applying Either or case:

1. The pair should be complementary in nature.

Some A are B  No A are B

All A are B  Some A are not B.

As we can see there are only two pairs possible which are complimentary in nature, therefore whenever come across pair of these type hold your thoughts and check them for either or case by checking them through the remaining two rules.

2. The conclusion pair should contain same parameters or entities.
3. While individually checking the conclusions answer should be doesn't follow.

If any complementary pair is following the last two rules then definitely it's the case of either or.

Practice Exercise:

Directions(1-10):In each of the questions below are given few statements are given followed by few Conclusions. You must take the given statements to be true even if they seem to be at variance from commonly known facts. Read all the Conclusions and then decide which of the given Conclusions logically follows from the given statements disregarding commonly known facts.

Q1. Statements:

1. Some Bats are Pads.
2. All Wickets are Trains.
3. At least some Buses are Pads.
4. No Buses are Wickets.

Conclusions:

1. All Pads are Trains.
2. Some Trains are Wickets.
3. Some Buses are Bats.
4. Some Pads are Buses.

(a) If only 2 follows
(b) If only 1 follows
(c) If only 2 and 4 follows.
(d) If only 3 follows

Q2. Statements:

1. All Tigers are Dogs.
2. All Cats are Lions.
3. Some Tigers are Cats.
4. All Cows are Lions.

Conclusions:

1. Some Dogs are Cats.
2. Some Cows are Dogs.
3. Some Lions are Tigers
4. All Cats are Dogs.

(a) If only 1 follows
(b) If only 2 follows
(c) If only 1 and 4 follow
(d) If only 1 and 3 follow

Q3. Statements:

1. Some Melons are Kiwis.
2. All Grapes are Plumps.
3. All Kiwis are Apples
4. No Apples are Grapes.

Conclusions:

1. Some Apples are Melons.
2. Some Grapes are Kiwis.
3. No Apples are Plums.
4. No Melons are Grapes.

(a) If only 1 follows
(b) If only 1 and 3 follows
(c) If only 1 and 4 follow
(d) If only 2 follows

Q4. Statements:

1. At least some Trams are Autos.
2. All Trams are Cycles.
3. All Cycles are Trucks.
4. No Trains are Cycles.

Conclusions:

1. Some Trucks are Autos.
2. No Trams are Trains.
3. No Trains are Autos
4. Some Trains are not Trucks

(a) If only 1 follows
(b) If only 1 and 2 follow
(c) If only 1,2 and 3 follow
(d) If all follow

Q5. Statements:

1. All Cats are Rats.
2. Some Jets are Mats.
3. No Rats are Jets
4. All Mats are Figs.

Conclusions:

1. No Jets are Cats.
2. No Cats are Mats.
3. Some Cats being Figs is a possibility
4. All Rats being Mats is a possibility

(a) If only 1 follows
(b) If only 1 and 3 follow
(c) If only 1,3 and 4 follow
(d) If all follow

Q6. Statements:

1. All Locks are Doors.
2. All Doors are Bags.
3. No Tickets are Doors
4. All Tickets are Keys

Conclusions:

1. Some Locks are not Tickets.
2. All Locks being Keys is a possibility.
3. All Bags being Keys is a possibility.
4. All Keys being Bags is a possibility.

(a) If only 1 follows
(b) If only 2 and 3 follow
(c) If only 1,2 and 3 follow
(d) If all follow

Q7. Statements:

1. Some Jugs are Mugs.
2. At least some Mugs are Plates.
3. All Plates are Forks.
4. All Forks are Spoons.

Conclusions:

1. Some Plates not being Spoon is a possibility.
2. Some Forks, which are not Plates, are Mugs.
3. All Jugs being Spoons is a possibility.
4. Some Spoons, which are not Forks, being Mugs is a possibility.

(a) If only 2 follows
(b) If only 1 and 2 follow
(c) if only 3 and 4 follow
(d) None of these

Q8. Statements:

1. All Canines are Cats.
2. All Felines are Apes.
3. No Apes are Canines.
4. Some Dogs are Apes.

Conclusions:

1. Some Cats are Apes.
2. No Cats are Apes.

(a) If only 1 follows
(b) If only 2 follows
(c) If either 1 or 2 follows
(d) If neither 1 nor 2 follows

Q9. Statements:

1. Some Erasers are Spurs.
2. No Spur is a Grill.
3. All Grills are Seals

Conclusions:

1. Some Seals are Erasers
2. Some Grills are Erasers
3. No Seal is a Eraser

(a) None follows
(b) Only I follows
(c) Only II follows
(d) Either I or III follow

Q10. Statements:

1. Some Lanes are Rivers.
2. Some Rivers are Packs.
3. Some Packs are Petals

Conclusions:

1. Some Petals are Rivers
2. Some Packs are Lanes
3. Some Petals are Lanes

(a) None follows
(b) Only I follows
(c) Only II follows
(d) Only III follows.

Directions (11-20): In each of the questions below 2 statements are given followed by two Conclusions. You must take the given statements to be true even if they seem to be at variance from commonly known facts. Read all the Conclusions and mark answer option as:

a. If only conclusion I follows
b. If only conclusion II follows
c. If both conclusions follow
d. If either I or II follows
e. If neither I nor II follows

Q11.
Statement 1: All doctors are educated individuals.
Statement 2: Some educated individuals are successful professionals.
Conclusion 1: Some successful professionals are doctors.
Conclusion 2: Some doctors are successful professionals.

Q12.
Statement 1: No politicians are honest.
Statement 2: Some lawyers are politicians.
Conclusion 1: Some lawyers are not honest.
Conclusion 2: Some lawyers are politicians.

Q13.
Statement 1: All dogs are mammals.
Statement 2: Some mammals are carnivores.
Conclusion 1: Some carnivores are dogs.
Conclusion 2: Some dogs are carnivores.

Q14.
Statement 1: No fruits are vegetables.
Statement 2: All apples are fruits.
Conclusion 1: No apples are vegetables.
Conclusion 2: All apples are fruits.

Q15.
Statement 1: All cats are animals.
Statement 2: Some animals are pets.
Conclusion 1: Some pets are cats.
Conclusion 2: Some cats are pets.

Q16.
Statement 1: No poets are mathematicians.

Statement 2: Some mathematicians are scientists.
Conclusion 1: Some scientists are not poets.
Conclusion 2: Some scientists are mathematicians.

Q17.
Statement 1: All laptops are electronic devices.
Statement 2: Some electronic devices are expensive.
Conclusion 1: Some expensive items are laptops.
Conclusion 2: Some laptops are expensive.

Q18.
Statement 1: No roses are blue.
Statement 2: All violets are flowers.
Conclusion 1: No violets are blue.
Conclusion 2: All violets are flowers.

Q19.
Statement 1: All students study.
Statement 2: Some students are diligent.
Conclusion 1: Some diligent individuals are students.
Conclusion 2: Some students are diligent.

Q20.
Statement 1: No birds can swim.
Statement 2: Some penguins are birds.
Conclusion 1: Some penguins cannot swim.
Conclusion 2: Some penguins are birds.