Sure! Here's a detailed explanation of **syllogism in logic** along with examples and explanations.

What is Syllogism?

Syllogism is a form of logical reasoning where a conclusion is drawn from two given or assumed premises (statements). Each of these premises shares a common term with the conclusion. It is a way to infer new information based on existing statements.

Basic Structure of a Syllogism:

- **Premise 1**: Major premise
- **Premise 2**: Minor premise
- **Conclusion**: What logically follows from the two premises

Example format:

- All A are B. (Major premise)
- All B are C. (Minor premise)
- Therefore, All A are C. (Conclusion)

Types of Statements in Syllogism:

1. **Universal Affirmative (A)**: All A are B
2. **Universal Negative (E)**: No A are B
3. **Particular Affirmative (I)**: Some A are B
4. **Particular Negative (O)**: Some A are not B

Example 1:

Premise 1: All dogs are animals.
Premise 2: All animals have four legs.
Conclusion: Therefore, all dogs have four legs.

Explanation:

- Premise 1 links dogs to animals.
- Premise 2 links animals to having four legs.
- So by transitivity, dogs have four legs.

Example 2:

Premise 1: No cats are birds.
Premise 2: All birds have wings.
Conclusion: Therefore, no cats have wings.

Explanation:

- Premise 1 states cats and birds are mutually exclusive.
- Premise 2 says birds have wings.
- So no cats have wings, because cats aren't birds.

Example 3:

Premise 1: Some students are hardworking.
Premise 2: All hardworking people pass exams.
Conclusion: Some students pass exams.

Explanation:

- Premise 1 says a part of students are hardworking.
- Premise 2 says all hardworking people pass exams.
- So some students (the hardworking ones) pass exams.

Example 4 (Invalid Syllogism):

Premise 1: All cars are vehicles.
Premise 2: Some vehicles are trucks.
Conclusion: Therefore, some cars are trucks.

Why invalid?

- Premise 1: cars are a subset of vehicles.
- Premise 2: some vehicles are trucks (no info about cars).
- Conclusion assumes an overlap between cars and trucks without evidence.

Summary Tips:

- The conclusion must only include terms that appear in the premises.
- The middle term (here, "animals" in Example 1) must be distributed correctly.
- The conclusion can only be drawn if the premises logically support it.
- Be careful with particular (some) and universal (all/no) statements.

If you want, I can also provide solved practice questions on syllogism or MCQs to test your understanding! Would you like that?