Introduction to Logical Reasoning

Lecture #23

Categorical Syllogisms

Professor David Emmanuel Gray

Carnegie Mellon University in Qatar
Northwestern University in Qatar

Four Standard Forms of Categorical Statements

Universal Positive

A: All *X* is *Y*.

Shade in all of *X* not shared with *Y*.

Universal Negative

E: No *X* is *Y*.

Shade in all of *X* shared with *Y*.

Particular Positive

I: Some *X* is *Y*.

Dot-*x* in *X* shared with *Y*.

Particular Negative

O: Some *X* is not *Y*.

Dot-*x* in *X* not shared with *Y*.

Note: A complement like non-*S* or non-*P* can substitute *X* or *Y*.

Categorical Syllogisms

A **categorical syllogism** is an argument involves exactly three categorical statements (two premises, and one conclusion) that have a special form involving only three categories in total.

A Categorical Syllogism

Some famous writers are mediocre hacks, but no insightful journalists are mediocre hacks. As a result, some famous writers are not insightful journalists.

A Categorical Syllogism (Initial Parse)

Some famous writers are mediocre hacks, but no insightful journalists are mediocre hacks. As a result, some famous writers are not insightful journalists.

CI C

Note #1: Now we return to breaking apart any *conjunctive* statements (like that first sentence above) by treating each conjunct as a separate statement.

Note #2: There are two premises in the above argument, but *I have not yet numbered them*. There is a special way for numbering the statements in a categorical syllogism that I will explain in a moment.

Some Technical Definitions

The **major term** (P) of a categorical syllogism is the predicate term of the conclusion.

The **minor term** (S) of a categorical syllogism is the subject term of the conclusion.

The **middle term** (M) of a categorical syllogism is the term appearing in both premises but not in the conclusion.

Standard Symbolic Form

Now we can put the argument into standard symbolic form.

To do this, **first** identify the major (*P*), minor (*S*), and middle (*M*) terms of the categorical syllogism:

Major term (*P*): Insightful journalists.

Minor term (*S*): Famous writers.

Middle term (*M*): Mediocre hacks.

Standard Symbolic Form

Second, we number the premises of the categorical syllogism:

> Premise 1 is always the premise of the categorical syllogism that has the major term (*P*) in it. This is the **major premise**.
>
> Premise 2 is always the premise of the categorical syllogism that has the minor term (*S*) in it. This is the **minor premise**.

Numbering the Premises

Some famous writers are mediocre hacks (2), but no insightful journalists are mediocre hacks (1). As a result (CI), some famous writers are not insightful journalists (C).

Note: In this case, the premises are *not* numbered in the order in which they appear. This is because the major premise, the premise with the major term (*P* = insightful journalists), is *always* treated as the first premise—even if it appears sequentially later in the argument.

Standard Symbolic Form

Third, symbolize the categorical syllogism using these identifiers for the major (*P*), minor (*S*), and middle (*M*) terms:

1. No *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.

Putting the argument in this form will now make it much easier to check its validity.

Today, I will show the "memorization" method for assessing the validity of a categorical syllogism. Next class, I will show the much more useful Venn diagram method.

The Mood of a Syllogism

The **mood** of a categorical syllogism expresses the three standard-form categorical statements that it contains. Therefore the mood consists of three letters: premise 1's logical form, premise 2's logical form, and the conclusion's logical form.

The Mood of a Syllogism

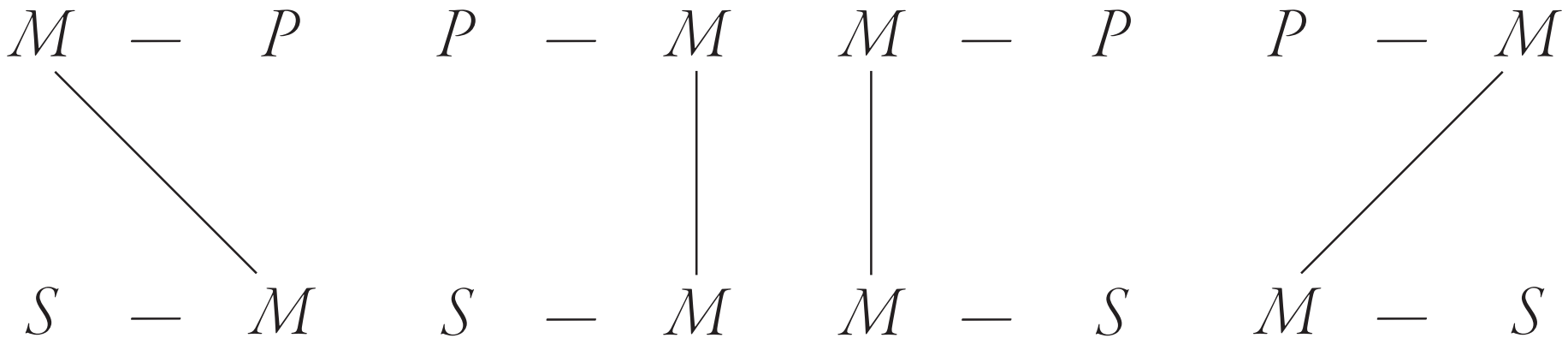
1.	No *P* is *M*.	[An **E** statement.]
2.	Some *S* is *M*.	[An **I** statement.]
∴	Some *S* is not *P*.	[An **O** statement.]

In this example, the mood is **EIO** because premise 1 is an **E** statement while premise 2 is an **I** statement, and the conclusion is an **O** statement.

The order of the letters matters. Premise 1's logical form comes first, premise 2's second, and the conclusion's third.

The Figure of a Syllogism

The **figure** of a categorical syllogism represents the argument's logical shape, which is determined by the position of the middle term (M) in the premises. There are only four possible figures:



The Figure of a Syllogism

In the example, the middle term appears as the predicate term of both premise 1 and premise 2. So its figure is looks like this:

1. No *P* is *M*.

2. Some *S* is *M*.

Hence this categorical syllogism has figure 2.

The Form of a Syllogism

Any categorical syllogism can be categorized by its **form**, which is simply the syllogism's mood, followed by a hyphen, followed by the syllogism's figure.

For instance, the example has the form of **EIO–2**.

Form and Validity

It turns out that the logical form of a categorical syllogism (it sequence of three letters and a number) is sufficient to determine the validity of that argument.

In fact, form **EIO–2** is logically valid, and logicians have given this form a special Latin name: *Festino*.

"Memorization" Method for Assessing Validity

The complete list of all valid categorical syllogisms:

AAA–1 *Barbara*	**AEE–2** *Camestres*	**AII–3** *Datisi*	**AEE–4** *Camenes*
EAE–1 *Celarent*	**EAE-2** *Cesare*	**IAI–3** *Disamis*	**IAI–4** *Dimaris*
AII–1 *Darii*	**AOO-2** *Baroko*	**EIO–3** *Ferison*	**EIO–4** *Fresison*
EIO–1 *Ferio*	**EIO-2** *Festino*	**OAO–3** *Bokardo*	

Any categorical syllogism whose logical form is *not* on this list is invalid.

Argument 1

Is the following categorical syllogism valid or invalid?

Some popular journalists are mediocre hacks, but all pathetic failures are mediocre hacks. Thus, some popular journalists are not pathetic failures.

Argument 1 (Initial Parse)

Some popular journalists are mediocre hacks, but all pathetic failures are mediocre hacks. Thus, some popular journalists are not pathetic failures.

C

Argument 1 (The Terms)

Major term (*P*): Pathetic failures,

Minor term (*S*): Popular journalists, and

Middle term (*M*): Mediocre hacks.

Argument 1 (Final Parse)

Some popular journalists are mediocre hacks (2), but all pathetic failures are mediocre hacks (1). Thus (CI), some popular journalists are not pathetic failures (C).

Argument 1 (Standard Form)

1. All *P* is *M*.
2. Some *S* is *M*.

∴ Some *S* is not *P*.

Argument 1 (Mood)

1.	All *P* is *M*.	[An **A** statement.]
2.	Some *S* is *M*.	[An **I** statement.]
∴	Some *S* is not *P*.	[An **O** statement.]

Mood: **AIO**.

Argument 1 (Figure)

1. All *P* is *M*. [An **A** statement.]

[Figure 2.]

2. Some *S* is *M*. [An **I** statement.]

∴ Some *S* is not *P*. [An **O** statement.]

Mood: **AIO**.

Figure: 2.

Argument 1 (Form)

1. All *P* is *M*. [An **A** statement.]

[Figure 2.]

2. Some *S* is *M*. [An **I** statement.]

∴ Some *S* is not *P*. [An **O** statement.]

Mood: **AIO**.

Figure: 2.

Form: **AIO-2**.

Argument 1 (Validity)

1. All *P* is *M*. [An **A** statement.]

[Figure 2.]

2. Some *S* is *M*. [An **I** statement.]

∴ Some *S* is not *P*. [An **O** statement.]

Mood: **AIO**.

Figure: 2.

Form: **AIO-2**.

This categorical syllogism is *invalid* because **AIO-2** is not a valid form.

Argument 2

Is the following categorical syllogism valid or invalid?

Some clever people are journalists, and all clever people are hard workers. As a result, some journalists are hard workers.

Argument 2 (Initial Parse)

Some clever people are journalists, and all clever people are hard workers. Therefore, some journalists are hard workers.

CI

C

Argument 2 (The Terms)

Major term (*P*): Hard workers,

Minor term (*S*): Journalists, and

Middle term (*M*): Clever people.

Argument 2 (Final Parse)

Some clever people are journalists (2), and all clever people are hard workers (1). Therefore (CI), some journalists are hard workers (C).

Argument 2 (Standard Form)

1. All *M* is *P*.
2. Some *M* is *S*.

∴ Some *S* is *P*.

Argument 2 (Mood)

1.	All *M* is *P*.	[An **A** statement.]
2.	Some *M* is *S*.	[An **I** statement.]
∴	Some *S* is *P*.	[An **I** statement.]

Mood: **AII**.

Argument 2 (Figure)

1. All *M* is *P*. [An **A** statement.]

[Figure 3.]

2. Some *M* is *S*. [An **I** statement.]

∴ Some *S* is not *P*. [An **I** statement.]

Mood: **AII**.

Figure: 3.

Argument 2 (Form)

1. All *M* is *P*. [An **A** statement.]

[Figure 3.]

2. Some *M* is *S*. [An **I** statement.]

∴ Some *S* is not *P*. [An **I** statement.]

Mood: **AII**.

Figure: 3.

Form: **AII-3**.

Argument 2 (Validity)

1. All *M* is *P*. [An **A** statement.]

[Figure 3.]

2. Some *M* is *S*. [An **I** statement.]

∴ Some *S* is not *P*. [An **I** statement.]

Mood: **AII**.

Figure: 3.

Form: **AII-3**.

This categorical syllogism is *valid* because **AII-3** is *Datisi*, a valid form.

Next Class...

We will learn how to use Venn diagrams to assess the validity of categorical syllogisms. This is a much better way for checking validity, though the memorization method remains a good way to check your work.

Also, please do not forget to turn in your response to the Lecture #23 Questionnaire on your way out.