02
WHAT IS AN ARGUMENT?

Paal Antonsen
antonsp@tcd.ie
https://sites.google.com/site/paalantonsen/teaching/logic

Formal Logic
We’ve introduced some central concepts and looked at examples.
The story so far...

▶ We’ve introduced some central concepts and looked at examples

Logic is the study of arguments (of the kind used in philosophy), and in particular, what makes such arguments good.
We’ve introduced some central concepts and looked at examples.

Logic is the study of arguments (of the kind used in philosophy), and in particular, what makes such arguments good.

An argument is a pair \( \langle X, A \rangle \), where \( X \) is a set of propositions (the premises) and \( A \) is a single proposition (the conclusion).
We’ve introduced some central concepts and looked at examples.

Logic is the study of **arguments** (of the kind used in philosophy), and in particular, what makes such arguments **good**.

An argument is a pair \( \langle X, A \rangle \), where \( X \) is a set of propositions (the premises) and \( A \) is a single proposition (the conclusion).

**Validity: generic**

An argument \( \langle X, A \rangle \) is **valid** iff in every case, if all the premises \( X \) are true then the conclusion \( A \) is also true.

John saves Ashley or he saves Kaidan
If John saves Ashley then he makes a mistake
John doesn’t make a mistake

Therefore, John saves Kaidan
Today we will focus on arguments. As said, in this course want to learn how to check validity of arguments, such as

Granny died if she swallowed the horse
Granny swallowed the horse, if the swallowed the dog
Granny swallowed the dog, if she swallowed the cat
Granny swallowed the cat, if she swallowed the bird
Granny swallowed the bird, if she swallowed the spider
Granny swallowed the spider, if she swallowed the fly
Granny swallowed the fly

Therefore, Granny died
Today we will focus on arguments. As said, in this course want to learn how to check validity of arguments, such as

Granny died if she swallowed the horse
Granny swallowed the horse, if the swallowed the dog
Granny swallowed the dog, if she swallowed the cat
Granny swallowed the cat, if she swallowed the bird
Granny swallowed the bird, if she swallowed the spider
Granny swallowed the spider, if she swallowed the fly
Granny swallowed the fly

Therefore, Granny died

In terminology introduced, all the things above the line are called the premises and the thing below the line is the called the conclusion.
Today we will focus on arguments. As said, in this course want to learn how to check validity of arguments, such as

Granny died if she swallowed the horse
Granny swallowed the horse, if the swallowed the dog
Granny swallowed the dog, if she swallowed the cat
Granny swallowed the cat, if she swallowed the bird
Granny swallowed the bird, if she swallowed the spider
Granny swallowed the spider, if she swallowed the fly
Granny swallowed the fly

Therefore, Granny died

In terminology introduced, all the things above the line are called the premises and the thing below the line is the called the conclusion.

But what kinds of things are premises and conclusions?
Let’s start with what they’re not: sentences.
Let’s start with what they’re not: sentences.

Why not? Because premises and conclusions can be true or false, but it doesn’t always make sense to ask whether sentences are true.
Let’s start with what they’re not: sentences.

Why not? Because premises and conclusions can be true or false, but it doesn’t always make sense to ask whether sentences are true.

(1) I am Batman

Declarative
Let’s start with what they’re not: *sentences*.

Why not? Because premises and conclusions can be *true or false*, but it doesn’t always make sense to ask whether sentences are true.

1. I am Batman  
   *Declarative*
2. Am I Batman?  
   *Interrogative*
Let’s start with what they’re not: sentences.

Why not? Because premises and conclusions can be true or false, but it doesn’t always make sense to ask whether sentences are true.

(1) I am Batman
(2) Am I Batman?
(3) Jolene, please don’t take my man

Declarative
Interrogative
Jussive
Let's start with what they’re not: sentences.

Why not? Because premises and conclusions can be true or false, but it doesn’t always make sense to ask whether sentences are true.

1. I am Batman
2. Am I Batman?
3. Jolene, please don’t take my man
4. If only Jolene doesn’t take my man

(1) Declarative
(2) Interrogative
(3) Jussive
(4) Optative
Let’s start with what they’re not: **sentences**.

Why not? Because premises and conclusions can be **true or false**, but it doesn’t always make sense to ask whether sentences are true.

(1) I am Batman  
    **Declarative**

(2) Am I Batman?  
    **Interrogative**

(3) Jolene, please don’t take my man  
    **Jussive**

(4) If only Jolene doesn’t take my man  
    **Optative**

If we try to categorize (2) – (4) as true or false we are doing some kind of category mistake. Their grammatical function is not to make claims.
Premises and conclusions

▶ Should we then say that they are declarative sentences?
Premises and conclusions

► Should we then say that they are declarative sentences?

► That doesn’t make sense either. Different sets of declarative sentences can express the very same argument.
Premises and conclusions

- Should we then say that they are declarative sentences?

- That doesn’t make sense either. Different sets of declarative sentences can express the very same argument.

If the monkey is on the branch, then the cat is on the chair
The monkey is on the branch
Therefore, the cat is on the chair
Premises and conclusions

- Should we then say that they are declarative sentences?

- That doesn’t make sense either. Different sets of declarative sentences can express the very same argument.

If the monkey is on the branch, then the cat is on the chair
The monkey is on the branch

Therefore, the cat is on the chair

Si le singe est sur la branche, alors le chat est sur la chaise
Le singe est sur la branche

Donc, le chat est sur la chaise.
Premises and conclusions

Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.
Premises and conclusions

▶ Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

▶ Sentences can be context dependent:
Premises and conclusions

Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

Sentences can be context dependent:

(5) I am Batman
Premises and conclusions

Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

Sentences can be context dependent:

(5) I am Batman
(6) The Joker broke out of prison yesterday
Premises and conclusions

- Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

- Sentences can be context dependent:
  
  (5) I am Batman
  
  (6) The Joker broke out of prison yesterday

- Sentences can be ambiguous:

  (7) All the soldiers waived at a girl

  (8) BERNHARD: I didn’t sleep with my wife until we got married
  
  BIANCA: Neither did I

- We also have to distinguish what is said from what is implied:

  (9) JESSE: I propose a toast to my husband and the love of my life
  
  (May they never meet)

  (10) INSPECTOR BUCKET: Wait . . .
  
  Now I’ve figured out who really murdered Lady Agatha: it was the Baron!

  OFFICER PINKY: He’s been dead for five years
Premises and conclusions

- Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

- Sentences can be context dependent:
  1. I am Batman
  2. The Joker broke out of prison yesterday

- Sentences can be ambiguous:
  3. All the soldiers waived at a girl
Premises and conclusions

► Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

► Sentences can be context dependent:
(5) I am Batman
(6) The Joker broke out of prison yesterday

► Sentences can be ambiguous:
(7) All the soldiers waived at a girl
(8) BERNHARD: I didn’t sleep with my wife until we got married
   BIANCA: Neither did I
Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

Sentences can be context dependent:
(5) I am Batman
(6) The Joker broke out of prison yesterday

Sentences can be ambiguous:
(7) All the soldiers waived at a girl
(8) BERNHARD: I didn’t sleep with my wife until we got married
  BIANCA: Neither did I

We also have to distinguish what is said from what is implied:
Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

Sentences can be context dependent:

(5) I am Batman
(6) The Joker broke out of prison yesterday

Sentences can be ambiguous:

(7) All the soldiers waived at a girl
(8) BERNHARD: I didn’t sleep with my wife until we got married
       BIANCA: Neither did I

We also have to distinguish what is said from what is implied:

(9) JESSE: I propose a toast to my husband and the love of my life
Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

Sentences can be context dependent:

(5) I am Batman
(6) The Joker broke out of prison yesterday

Sentences can be ambiguous:

(7) All the soldiers waived at a girl
(8) BERNHARD: I didn’t sleep with my wife until we got married
   BIANCA: Neither did I

We also have to distinguish what is said from what is implied:

(9) JESSE: I propose a toast to my husband and the love of my life
    (May they never meet)
Premises and conclusions

Furthermore, before we can assess whether a sentence is true or false, we need to know what it says, or what proposition is expressed.

Sentences can be context dependent:

(5) I am Batman
(6) The Joker broke out of prison yesterday

Sentences can be ambiguous:

(7) All the soldiers waived at a girl
(8) BERNHARD: I didn’t sleep with my wife until we got married
    BIANCA: Neither did I

We also have to distinguish what is said from what is implied:

(9) JESSE: I propose a toast to my husband and the love of my life
    (May they never meet)
(10) INSPECTOR BUCKET: Wait. . . Now I’ve figured out who really murdered
    Lady Agatha: it was the Baron!
    OFFICER PINKY: He’s been dead for five years
Arguments, in the sense that concerns us, consist of a (possible empty) set of propositions we call the premises and a single proposition we call the conclusion.

Premises and conclusions
Arguments, in the sense that concerns us, consist of a (possible empty) set of propositions we call the premises and a single proposition we call the conclusion.

We don’t just want an explanation of why this or that argument is valid. We are after something much more general. We want a theory of what makes arguments valid by virtue of their logical form.
Arguments, in the sense that concerns us, consist of a (possible empty) set of propositions we call the premises and a single proposition we call the conclusion.

We don’t just want an explanation of why this or that argument is valid. We are after something much more general. We want a theory of what makes arguments valid by virtue of their logical form.

To show why the argument on the left hand side is valid we need to identify its general argument form.

Tubby is a teddybear that hugs every child
Therefore, all children are hugged by someone

The liquid in this bottle turns litmus paper red
Therefore, the liquid in this bottle is acidic.
What is an argument form?

Before we try to answer that, let's look at something else.
What is an argument form?

Before we try to answer that, let’s look at something else.

The Ogre does what ogres can,
Deeds quite impossible for Man,
But one prize is beyond his reach:
The Ogre cannot master speech.

Now, compare Auden’s poem with mine.
My cat found a glass of chablis,
Drank it down with ravenous glee,
But one prize was paid for his feast:
My cat has turned into a beast.

They may not have much in common in terms of aesthetic value, but they do share a common rhythmical form.
What is an argument form?

Before we try to answer that, let’s look at something else.

The Ogre does what ogres can,
Deeds quite impossible for Man,
But one prize is beyond his reach:
The Ogre cannot master speech.

Now, compare Auden’s poem with mine.

My cat found a glass of chablis,
Drank it down with ravenous glee,
But one prize was paid for his feast:
My cat has turned into a beast.
What is an argument form?

Before we try to answer that, let’s look at something else.

The Ogre does what ogres can,
Deeds quite impossible for Man,
But one prize is beyond his reach:
The Ogre cannot master speech.

Now, compare Auden’s poem with mine.

My cat found a glass of chablis,
Drank it down with ravenous glee,
But one prize was paid for his feast:
My cat has turned into a beast.

They may not have much in common in terms of aesthetic value, but they do have in common the same rhythmic form.
What is an argument form?

Before we try to answer that, let’s look at something else.

The Ogre does what ogres can,
Deeds quite impossible for Man,
But one prize is beyond his reach:
The Ogre cannot master speech.

Now, compare Auden’s poem with mine.

My cat found a glass of chablis,
Drank it down with ravenous glee,
But one prize was paid for his feast:
My cat has turned into a beast.

They may not have much in common in terms of aesthetic value, but they do have in common the same rhythmic form.
What is an argument form?

▶ Let’s turn our attention back again to the opening example.

John saves Ashley or he saves Kaidan
If John saves Ashley then he makes a mistake
John doesn’t make a mistake

Therefore, John saves Kaidan

Now, compare this argument with the following one.
Alexander invades India or he invades Spain
If Alexander invades India then he makes a strategic error
Alexander doesn’t make a strategic error

Therefore, Alexander invades Spain

They may not have much in common in terms of information, but they do have in common the same argument form.
What is an argument form?

Let’s turn our attention back again to the opening example.

John saves Ashley or he saves Kaidan
If John saves Ashley then he makes a mistake
John doesn’t make a mistake
Therefore, John saves Kaidan

Now, compare this argument with the following one.

Alexander invades India or he invades Spain
If Alexander invades India then he makes a strategic error
Alexander doesn’t make a strategic error
Therefore, Alexander invades Spain

They may not have much in common in terms of information, but they do have in common the same argument form.
What is an argument form?

Let’s turn our attention back again to the opening example.

John saves Ashley or he saves Kaidan
If John saves Ashley then he makes a mistake
John doesn’t make a mistake

Therefore, John saves Kaidan

Now, compare this argument with the following one.

Alexander invades India or he invades Spain
If Alexander invades India then he makes a strategic error
Alexander doesn’t make a strategic error

Therefore, Alexander invades Spain
What is an argument form?

Let’s turn our attention back again to the opening example.

John saves Ashley or he saves Kaidan
If John saves Ashley then he makes a mistake
John doesn’t make a mistake

Therefore, John saves Kaidan

Now, compare this argument with the following one.

Alexander invades India or he invades Spain
If Alexander invades India then he makes a strategic error
Alexander doesn’t make a strategic error

Therefore, Alexander invades Spain

They may not have much in common in terms of information, but they do have in common the same argument form.
What is an argument form?

Let’s turn our attention back again to the opening example.

John saves Ashley OR he saves Kaidan
IF John saves Ashley THEN he makes a mistake
IT IS NOT THE CASE THAT John makes a mistake
Therefore, John saves Kaidan

Now, compare this argument with the following one.

Alexander invades India OR he invades Spain
IF Alexander invades India THEN he makes a strategic error
IT IS NOT THE CASE THAT Alexander makes a strategic error
Therefore, Alexander invades Spain

They may not have much in common in terms of information, but they do have in common the same argument form.
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.

\( p \) = Princess Bella kisses the frog.
\( q \) = Princess Bella will be disgusted.
\( r \) = The frog turns into Prince Charming
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.

\[ p = \text{Princess Bella kisses the frog.} \]
\[ q = \text{Princess Bella will be disgusted.} \]
\[ r = \text{The frog turns into Prince Charming} \]
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.

\[ p = \text{Princess Bella kisses the frog.} \]
\[ q = \text{Princess Bella will be disgusted.} \]
\[ r = \text{The frog turns into Prince Charming} \]
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.

$p = $ Princess Bella kisses the frog.
$q = $ Princess Bella will be disgusted.
$r = $ The frog turns into Prince Charming

We get the following argument form:

If $p$ then $(q$ or $r)$
If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.

\( p = \) Princess Bella kisses the frog.
\( q = \) Princess Bella will be disgusted.
\( r = \) The frog turns into Prince Charming

We get the following argument form:

If \( p \) then \((q \text{ or } r)\)
Let's find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn't turn into Prince Charming. Therefore, Princess Bella will be disgusted.

\[ p = \text{Princess Bella kisses the frog.} \]
\[ q = \text{Princess Bella will be disgusted.} \]
\[ r = \text{The frog turns into Prince Charming} \]

We get the following argument form:

If \( p \) then (\( q \) or \( r \))
   \( p \) and not \( r \)
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.

\[ p = \text{Princess Bella kisses the frog.} \]
\[ q = \text{Princess Bella will be disgusted.} \]
\[ r = \text{The frog turns into Prince Charming} \]

We get the following argument form:

\[
\text{If } p \text{ then } (q \text{ or } r) \\
p \text{ and not } r
\]
Let’s find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn’t turn into Prince Charming. Therefore, Princess Bella will be disgusted.

\[ p = \text{Princess Bella kisses the frog.} \]
\[ q = \text{Princess Bella will be disgusted.} \]
\[ r = \text{The frog turns into Prince Charming} \]

We get the following argument form:

\[ \text{If } p \text{ then } (q \text{ or } r) \]
\[ p \text{ and not } r \]
\[ \text{--------} \]
\[ q \]
Let's find the argument form

If Princess Bella kisses the frog, then she will be disgusted or the frog turns into Prince Charming. She does kiss the frog and the frog doesn't turn into Prince Charming. Therefore, Princess Bella will be disgusted.

\[ p = \text{Princess Bella kisses the frog.} \]
\[ q = \text{Princess Bella will be disgusted.} \]
\[ r = \text{The frog turns into Prince Charming} \]

We get the following argument form:

\[
\begin{align*}
\text{If } p \text{ then } (q \text{ or } r) \\
p \text{ and not } r \\
\hline \\
q
\end{align*}
\]