

Logic basics

Logic is the study of *arguments*.

An **argument** is a set of *claims* consisting of one or more *premises* and a *conclusion*.

1 Claims

- Here are some important features of **claims**:
 - Claims are *true* or *false*. Claims cannot be both true and false. Claims cannot be *neither* true nor false.
 - Claims are always expressed by *declarative sentences*.
 - So, claims cannot be questions, imperatives, or exclamations.

EXERCISE 1: For each of the following, discuss whether it is a claim or not.

- (a) “How could God allow evil?”
- (b) “It is always wrong to eat meat.”
- (c) “Buy me a Coke, please.”
- (d) “Yuck!”
- (e) “The Gateway Arch is taller than the Statue of Liberty, and J.R.R. Tolkien is the author of *The Lord of the Rings*.”
- (f) “Why would you do something like that?”
- (g) “ $2 + 2 = 4$.”
- (h) “Paul wrote the song or John wrote the song.”
- (i) “If you live by the sword, then you die by the sword.”

2 Arguments

Arguments always consist of at least one *premise* and a *conclusion*.

The **premises** of an argument are claims that are intended to support the *conclusion*.

The **conclusion** of an argument is what the argument is ultimately trying to *show is true*.

EXERCISE 2: For each of the following, (i) discuss whether it is an argument or not, and (ii) if it is an argument, figure out what the premises are and what the conclusion is.

- (a) Thes always wears a shirt with birds on it on Wednesday. Today is Wednesday. So, Thes is wearing a shirt with birds on it today.
- (b) I don't like Schnuck's chocolate cake. It's too rich for me.
- (c) It's raining outside. So, you should take an umbrella with you.
- (d) I washed the dishes, and then I dried them.
- (e) Either John wrote *Octopus's Garden* or Paul did. But I don't think John wrote it. So, it must have been Paul.
- (f) Samsung stole some of Apple's patents for their smartphones, so Apple stole some of Samsung's patents in retaliation.

3 Numbering

Philosophers often **number** each claim in an argument. This makes it easier to see the overall structure of the argument. For example, we could number the claims of (a), (c), and (e).

Argument (a):

- (1) Thes always wears a shirt with birds on it on Wednesday.
- (2) Today is Wednesday.
- (3) So, Thes is wearing a shirt with birds on it.

Argument (c):

- (1) It's raining outside.
- (2) So, you should take an umbrella with you.

Argument (d):

- (1) Either John wrote *Octopus's Garden* or Paul wrote *Octopus's Garden*.
- (2) John did not write *Octopus's Garden*.
- (3) So, Paul wrote *Octopus's Garden*.

4 Validity and Soundness

We want to be able to tell *good* arguments from *bad* arguments. There are *two* important features of a good argument:

- Good arguments have premises that are true.
- Good arguments are **valid**.

“Validity” is a *technical term* in philosophy and mathematics. In philosophy and mathematics, **only arguments can be valid or invalid—nothing else!**

In philosophy and mathematics:

- Claims cannot be valid.
- Questions cannot be valid.
- Opinions cannot be valid.
- Preferences cannot be valid.
- Choices cannot be valid.
- Lifestyles cannot be valid.

In order to get the idea of validity, consider the following two arguments:

The Edible Moon Argument

- (1M) If the moon is made of cheese, then the moon is edible.
- (2M) The moon is made of cheese.
- (3M) Therefore, the moon is edible.

The Feathers Argument

- (1F) Camilla the chicken has feathers.
- (2F) Feathers are soft.
- (3F) So, it's wrong to eat Camilla the chicken.¹

EXERCISE 3: Both the *Edible Moon Argument* and the *Feathers Argument* are bad arguments. But are they both bad for the same reasons, or for different reasons? In your groups, try to figure out what makes each of these arguments bad, and if they are both bad for the same reason or not.

¹ This example and way of explaining validity is taken from Dan Korman's *Learning from Arguments*.

An argument is **valid** just in case it is impossible for the premises to be true and the conclusion to be false.

The problem with *The Feathers Argument*, then, is that it isn't *valid*. The conclusion could be false even if (1F) and (2F) were true. That is, it is possible for (1F) and (2F) to be true and (3F) to be false. In fact, (1F) and (2F), as I have already noted, are true.

An argument is **sound** just in case all its premises are true, *and* it is also valid.

EXAMPLES OF VALID ARGUMENT FORMS

Modus Ponens

- (1) If P, then Q.
- (2) P.
- (3) Therefore, Q.

Modus Tollens

- (1) If P, then Q.
- (2) Not-Q.
- (3) Therefore, not-P.

Disjunctive Syllogism

- (1) Either P or Q.
- (2) Not-P.
- (3) Therefore, Q.

Hypothetical Syllogism

- (1) If P, then Q.
- (2) If Q, then R.
- (3) Therefore, if P, then R.