



# Offer yr Athronydd The Philosopher's Toolbox

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# Arguments

Philosophers care a great deal about **arguments**, because philosophers try to answer philosophical questions by constructing, analysing and criticising arguments.

By 'arguments' we do not mean just any sort of argument. We are not concerned with cases where two people shout contradictions or names at each other or anything like that. We are concerned with arguments in a formal sense.

## Definition (Argument)

An argument consists of a set of sentences of which one is the conclusion and the rest are premises.



# Arguments

## Some examples

1. Willy Wonka owns a chocolate factory.  
——
2. Either Willy Wonka owns a chocolate factory or Willy Wonka's factory had a Great Glass Elevator.  
  
  1. Willy Wonka owns a chocolate factory.
  2. If Willy Wonka owns a chocolate factory, then somebody owns a chocolate factory.  
——
3. Somebody owns a chocolate factory.



# Arguments

## Some examples

1. Carol kissed Jane.
  2. If Carol kissed Jane, then Alice will be jealous.  
——
  3. Alice will be jealous.
- 
1. The sun has the measles.
  2. If the sun has the measles, then the Oompa-Loompas are reading Kant.  
——
  3. The Oompa-Loompas are reading Kant.



# Arguments

## Form

Notice that the last two arguments have the same form:

1. A.
2. If A, then B.

—

3. B.



## Deductive Validity & Deductive Soundness

We are particularly concerned with the structure of arguments and so we introduce a special notion:

### Definition (Deductive Validity)

An argument is **deductively valid** iff *if* the premises are true, *then* the conclusion *must* be true as well.

In other words, the conclusion *follows from* the premises.

### Definition (Deductive Invalidity)

An argument is **deductively invalid** iff it is *not* deductively valid.

In other words, it is *possible* that the premises could be true and the conclusion false.



## Deductive Validity & Deductive Soundness

It is tempting to assume that a deductive argument must be *good* if, and only if, it is *deductively valid*.

**Avoid this temptation!** Although a good deductive argument must be deductively valid, **many deductively valid arguments are rubbish!**

Philosophers use another term to describe arguments which are good — we say that they are **'sound'**.

So what does it take for a deductive argument to be **deductively sound**?

### Definition (Deductive Soundness)

An argument is **deductively sound** iff it is deductively valid *and* it has all true premises.

(It follows that the conclusion must be true.)





## Deductive Validity & Deductive Soundness

1. My cat likes biscuits best.
2. If I live in a tree-house, then my cat is an astrophysicist.  
——
3. My cat is an astrophysicist.



## Deductive Validity & Deductive Soundness

1. Seawater is salty.
2. If bricks are solid, then water is  $H_2O$ .
- 
3. Water is  $H_2O$ .



## Deductive Validity & Deductive Soundness

Arguments can be deductively valid with:

- ▶ some false premises and a false conclusion
- ▶ true premises and a true conclusion
- ▶ some false premises and a true conclusion

The *only* combination *not* possible for a deductively valid argument is all true premises and a false conclusion.

An argument can be deductively invalid with:

- ▶ some false premises and a false conclusion
- ▶ true premises and a true conclusion
- ▶ some false premises and a true conclusion
- ▶ all true premises and a false conclusion



## Our Earlier Examples Reconsidered

Let's apply these ideas to the examples we saw earlier.

For each argument, we want to know:

1. is the argument deductively valid?
2. is it deductively sound?



## Our Earlier Examples Reconsidered

1. Willy Wonka owns a chocolate factory.  
——
2. Either Willy Wonka owns a chocolate factory or Willy Wonka's factory had a Great Glass Elevator.



## Our Earlier Examples Reconsidered

1. Willy Wonka owns a chocolate factory.
2. If Willy Wonka owns a chocolate factory, then somebody owns a chocolate factory.  
——
3. Somebody owns a chocolate factory.



## Our Earlier Examples Reconsidered

1. Carol kissed Jane.
2. If Carol kissed Jane, then Alice will be jealous.

——

3. Alice will be jealous.



## Our Earlier Examples Reconsidered

1. The sun has the measles.
2. If the sun has the measles, then the Oompa-Loompas are reading Kant.  
——
3. The Oompa-Loompas are reading Kant.





## Our Earlier Examples Reconsidered

Notice that the last two arguments have the same form:

1. A.
2. If A, then B.  
——
3. B.



# A Mystery Hand

1. ♣
2. *If ♣, then ◇*  
——
3. ◇

*You may assume that '♣' and '◇' are both statements.*



## So far, So good

For the arguments you've seen so far, it has been fairly easy (relatively speaking) to decide whether an argument is deductively valid or deductively invalid.

This isn't, however, always so. . .



## Double Trouble?

1. Babies are illogical.
2. Nobody is despised who can manage a crocodile.
3. Illogical persons are despised.

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4. Babies cannot manage crocodiles.



## Double Trouble?

1. None of the unnoticed things, met with at sea, are mermaids.
2. Things entered in the log, as met with at sea, are sure to be worth remembering.
3. I have never met with anything worth remembering, when on a voyage.
4. Things met with at sea, that are noticed, are sure to be recorded in the log.  
—
5. I have never come across a mermaid at sea.



## Double Trouble?

1. You cannot trust anything you read in the papers.
2. You never read about my cat in the papers.
3. Cats are only trustworthy if they have silver eyes.  
——
4. My cat has silver eyes.



## Double Trouble?

1. The only animals in this house are cats.
2. Every animal is suitable for a pet, that loves to gaze at the moon.
3. When I detest an animal, I avoid it.
4. No animals are carnivorous, unless they prowl at night.
5. No cat fails to kill mice.
6. No animals ever take to me, except what are in this house.
7. Kangaroos are not suitable for pets.
8. None but carnivora kill mice.
9. I detest animals that do not take to me.
10. Animals, that prowl at night, always love to gaze at the moon.  
\_\_\_\_\_
11. I always avoid a kangaroo.



## Double Trouble?

Three of the examples shown are from *The Complete Works of Lewis Carroll*. Random House:

- ▶ the one about babies, crocodiles and logic
  - ▶ the one about mermaids, voyages and logs made at sea
- and,
- ▶ the one about cats, kangaroos, moon-gazers and suitable pets