

Reason as a way of knowing

Neils Bohr (1885–1962) to **Einstein**: ‘You are not thinking. You are merely being logical.’

Reason is the power of the mind to think, understand and form judgments by a process of logic.

Logic is rule-based system that infers knowledge based on true premises that lead to a valid conclusion

Evidence is perceived, then we:

- add premises (assumptions)
- use reasoning
- reach new knowledge.

Rationalism (p.142)

- Reason is the most important source of new knowledge.
- We can discover new truths by using reason alone.
- Our senses can mislead us.

Three types of reasoning

- deductive
- inductive
- informal

Deductive reasoning (e.g. a syllogism) (pp. 143-149)

A **general claim** about all leads to a **specific claim** about an individual ie. From general to particular.

Syllogisms

Premise: an assumption you take to be true

Premises combined to make an argument lead to a conclusion

If the premises are true and the conclusion valid, you have solid reasoning.

Premise

Premise

Conclusion

All dogs bark	+ Toby is a dog	→ Toby barks
All As are Bs	+ Some As are Cs	→ Some Bs are Cs

<p>Premise: All food at the cafeteria is disgusting Premise: My lunch come from the cafeteria Conclusion: My lunch is disgusting</p>

Task 1: Try this syllogism

Premise 1: All dogs are mammals

Premise 2: Fido is a dog

Conclusion:

As you can see a syllogism consists of the following items:

1. Two premises and a conclusion
2. Three terms, each of which occurs twice
3. Quantifiers such as 'all', 'some' or 'no' which tell us the quantity that is being referred to.

Problems:

The reasoning may be **valid** but the conclusion may not always be **true/valid** if:

- one or both premises are flawed
- the reasoning used to reach the conclusion is flawed, e.g. Penguins are black and white. Old TV shows are black and white → therefore penguins are old TV shows.

Validity and Truth

Truth: concerned with what is the case

Validity: when conclusions logically follow from the premises

Premise: All panthers are pink

Premise: Mr. Santella is a panther

Conclusion: Mr. Santella is pink

The premises are false and the conclusion is false, but the reasoning is valid

Task 2: Are the following arguments valid or invalid?

1. All Italians eat spaghetti
Giovanni Rossi eats spaghetti
Therefore Giovanni Rossi is an Italian
2. No Martians have red noses
Rudolph has a red nose
Therefore Rudolph is not a Martian
3. Some monks are Tibetans
All Tibetans are good at yoga
Therefore some monks are good at yoga

Task 3: Supply the missing premise for each of the following enthymemes (when a premise is seen as obvious, one will not state it explicitly)

1. Jenny goes to Oxford University

Jenny must be very intelligent
2. Graham is a politician

So Graham is probably lying

Inductive reasoning (pp. 149-153)

- Reasoning that goes in the opposite direction to deductive reasoning from the particular to the general
- Constantly used in everyday life.
- Assumes past regularities will apply in the future because they did in the past.
- Helps survival, but we cannot always rely on it, as we tend to jump to conclusions on the basis of insufficient evidence.
- Has led to racism/sexism/bias.

Examples:

- How sure are you that some day you will die? What evidence do you have for your belief?

With reference to the above example, my belief that all human beings are mortal is a generalisation from a vast number of particular instances. In history, every human being I know of eventually died, and I have never heard of a human being that didn't die. Therefore, I can say with confidence that 'All observed human beings have died'.

But when we reason inductively we typically go further than this and generalise – or make an inductive inference – from the observed to the unobserved. Thus, in this example, we move from 'All observed human beings are mortal' to 'All human beings are mortal.'

Science uses inductive reasoning and typically formulates general laws on the basis of a limited number of observations.

Premise: Metal A expands when heated
Premise: Metal B expands when heated
Premise: Metal C expands when heated
Premise: Metal D expands when heated
Conclusion: all metals expand when heated

How many specific cases do you need to look at before your conclusion is strong?

How reliable is inductive reasoning?

Occasionally, we tend to make hasty generalisations and jump to conclusions on the basis of insufficient evidence. For example, if a tourist is served by a French waiter he may conclude that all French people are rude. Since the opinion is arrived at based on a single interaction, this conclusion is not justifiable.

This tendency to make hasty generalisations is made worse by a phenomenon known as **Confirmation bias**. Here people tend to remember only evidence that supports their beliefs and to forget evidence that goes against them.

Task 4 Take the Unstructured Inferential Test

To complete the exercise, read the following story. Below are 12 statements about the story. After you read the story, determine whether each of the 12 statements is

T – true;

F – false; or

? – you do not have enough information to determine whether the statement is true or false

Allow yourself no more than 5 minutes to complete the exercise. Ready? Here goes:

The Story

A businessman had just turned off the lights in the store when a man appeared and demanded money. The owner opened a cash register. The contents of the cash register were scooped up, and the man sped away. A member of the police force was notified promptly.

12 Statements about the Story

Statement	True/False or ?
1. A man appeared after the owner had turned off his store lights.	
2. The robber was a man.	
3. The man did not demand money.	
4. The man who opened the cash register was the owner.	
5. The store-owner scooped up the contents of the cash register and ran away.	
6. Someone opened a cash register.	
7. After the man who demanded the money scooped up the contents of the cash register, he ran away.	
8. While the cash register contained money, the story does not state how much.	

9. The robber demanded money of the owner.	
10. It was broad daylight when the man appeared.	
11. The story concerns a series of events in which only three persons are referred to: the owner of the store, a man who demanded money, and a member of the police force.	
12. The following events in the story are true: someone demanded money, a cash register was opened, its contents were scooped up, and a man dashed out of the store.	

Problems:

Avoidance of hasty generalisation depends on:

- Number of observations
- Variety of observations
- Active searching for exceptions
- Coherence: more evidence is needed for surprising conclusions
- Subject area: generalisations are more reliable in natural sciences (physics, chemistry, biology) than social sciences (psychology, economics, business).

Fallacious Reasoning

Informal reasoning: the ten deadly fallacies (pp. 153-159)

- 1 **Hasty generalisation:** (p.151) generalizing from insufficient evidence
- 2 ***Post hoc ergo propter hoc*** ('after this, therefore on account of this'; see p. 153-154). The assumption that changing one thing is the cause of a closely timed event. For example, assuming that abolishing capital punishment caused a rise in the number of murders. So you confuse a correlation with a causal connection
- 3 ***Ad hominem*** ('against the man'; see p. 155). Attacking or supporting a person rather than attacking or supporting an argument/principle. For example, 'You are too young to know what you are talking about.'
- 4 **Circular reasoning** (vicious circle/begging the question; see p. 155-156). Assuming the truth of something you are supposed to be proving. For example, 'I know Mary is a fairy because she said she was and fairies would not lie.' This assumes that Mary is a fairy in order to argue that she is a fairy.
- 5 **Special pleading** (p. 156). There is a tendency for people to apply laws of expected behaviour to other people that they do not stick to themselves, e.g. energy conservation, need to limit world population. So you make an exception in your own case for an event/practice that you would not accept if it came to someone else. For example, 'I know there is a drought and we need to conserve water, but I am putting my prize flowers in a competition next week and I need to give them plenty of water.'
- 6 **Equivocation** (p. 156). The same word may be used in different ways. Leads to arguments about meaning, e.g. 'A hamburger is better than nothing. Nothing is better than good health. Therefore, a hamburger is better than good health.' Although this argument is formally valid in the sense that the conclusion follows from the premises, there is clearly something wrong with it. The problem lies with the word 'nothing' because it has a different meaning in each of the premises. In the first premise, it means 'not having anything'; in the second, it means 'there is not anything'.
- 7 **Argument *ad ignorantiam*** (p. 157). Claims something is true because you have no evidence to disprove it, e.g. 'There is no evidence to disprove she is a witch, so she is a witch.' Richard Dawkins expressed this fallacy in the phrase 'There is an

infinity of possible things that one might believe – unicorns, fairies, millions of things – and just because you can't disprove them it doesn't mean there is anything plausible about them'.

- 8 False analogy** (p. 157-158). Assumes that because two things are similar in some ways, they are similar in another way, e.g. 'Problems are like mountains. Because mountains are worn down by rain, our problems can be solved by persistence.' The point is that there is not much of a similarity between the action of rain on mountains and that of patience on problems.
- 9 False dilemma** (binary thinking, p. 158). Assumes only two alternatives exist. (Note: humans may have a tendency towards this.) For example, 'increasing military expenditure means spending less on schools' – this suggests that we have only two choices. This way of thinking may have developed because evolution may have depended on fast friend/foe, fight/flight decisions (binary thinking).
- 10 Loaded questions** (p. 158-159). Questions that are biased because it contains/implies built-in assumptions, e.g. 'Do you always cheat in exams?' 'Yes' suggests you always cheat in exams; 'no' suggests you sometimes cheat in exams.

Task 5: Logical fallacies

What type of logical fallacies are the following?

Choose from

Hasty generalisation,	Post hoc ergo propter hoc
Circular reasoning,	Ad hominem
Special pleading	Ad ignorantium
False dilemma	False analogy
Equivocation	Loaded question

Statements

- a. Since strict gun control laws were introduced in Dodge City, the crime rate has risen. This shows that gun control does nothing to reduce crime.
- b. Emmeline said she trusted me, and she must be telling the truth because she wouldn't lie to someone that she trusted.
- c. It's OK to beat children to get them to behave. After all, if you want to make omelettes, you have to break eggs.

- d. That can't be right, none of my friends would believe it.
- e. Since many great scientists have believed in God, there must be some truth in religion.
- f. Teddy and Seanne got on very well on their two dates together. They are clearly well suited and should get married.
- g. Do you want to be part of the solution, or part of the problem?
- h. "I agree that you shouldn't copy mp3s illegally, but I've only copied a few and I do buy tracks sometimes."
- i. The average UK family has 2.5 children. The Smiths are average people, they must have 2.5 kids.
- j. Since no-one has been able to prove that God didn't create the universe, we must conclude that God did make everything.
- k. Are all your family stupid, or is it just you?
- l. No scandal has ever touched Mr Porter. He must be a clean living and honest man.
- m. Just as you are more likely to take care of a car that you own rather than a car that you rent, a slave owner would look after a slave better than an employer would look after their worker.
- n. To ignore the possibility that Norway landed the first person on the moon just because nobody has heard of a Norwegian space program is arrogant. If we are unaware of something does not mean that it never happened.
- o. In the fight against terrorism, you are either with the USA or against.

Causes of bad reasoning (p. 161)

- ignorance
- laziness
- pride
- prejudice

We are often tempted to resort to any argument to justify our reasoning → **rationalisation**.

Reason and certainty (pp. 162-163)

Reminder of the three types of reasoning:

- deductive
- inductive
- informal

All proof must end somewhere – it cannot be **infinitely regressive** (requiring the evidence of more and more things, successively and indefinitely).

For example, A depends on B, which depends on C, which depends on D... and so on, to infinity.

Three laws of thought are the basis of logical deductive reasoning:

- **Law of identity:** e.g. if A is a banana, then it is a banana.
- **Law of non-contradiction:** e.g. if A is a banana then it cannot be not-a-banana. (Common objection: some things are a mix of two other things, e.g. love–hate relationship – love some things at some times, hate them at other times.)
- **Law of the excluded middle:** e.g. everything is either a banana or not a banana.

Can deductive reasoning (the laws of logical reasoning) be doubted? (p.163)

- 1 It is unsure whether the laws exist or whether we just think they exist.
- 2 Logic depends on language, which is imprecise.
- 3 Everything is constantly changing so there is nothing for logic to be true of. Heraclitus the Greek philosopher was drawing attention to this when he famously said 'You can never step in the same river twice'.

Yes:

- Just because something always seems to happen it does not mean it always will (e.g. laws of physics, behaviour of people).

No:

- It seems advantageous to use past experience to predict the future.

Can inductive reasoning be doubted?

We saw earlier that induction cannot give us certainty because it involves a jump from 'All observed X' to 'All X'. Despite the obvious survival value of inductive reasoning we might ask how can we know

that the future will be similar to the past in any respect? How can you be sure that the laws of physics, together with countless everyday regularities that you take for granted, won't suddenly break down tomorrow? This is the premise of Franz Kafka's novel *Metamorphosis* whereby the protagonist wakes up one morning and realises he has been turned into an insect. You might reasonably insist that you know this will not happen because the world exhibits demonstrable regularities that prohibit this from happening. This has been true up until now; but how can you be sure that the laws of nature won't suddenly break down tomorrow?

Since inductive reasoning moves from the observed to the unobserved, there is in fact no way we can justify our belief in it on the basis of experience. And since it lacks the certainty of deduction, we cannot give a logical justification of it either. Therefore, it would seem that we cannot justify induction at all.

However, we might look at the situation in another way, and argue that using inductive reasoning is simply part of what it means to be rational. For although we question the validity of a particular generalisation, it makes no sense to question the general idea of using the past as a guide to the future.

Lateral thinking (p. 135)

Also known as 'thinking outside the box'.

- We can become trapped in a 'prison of consistency'.
- Learning new things requires questioning old ideas.
- **However**, it takes a lot of courage to question things you accepted as true.

Edward de Bono (1933–): 'Vertical thinking is digging the same hole deeper. Lateral thinking is trying elsewhere.'

Task 6: Use your lateral thinking

1: Give a rational explanation for each of the following situations. In each case you will need to question your assumptions and try to 'think outside the box'

- a. A man walks into a bar and asks the barman for a glass of water. The barman pulls out a gun and points it at the man. The man says 'Thank you' and walks out
- b. A man is lying dead in a field. Next to him there is an unopened package. There is no other creature in the field. How did he die?
- c. Anthony and Cleopatra are lying dead on the floor of a villa in Egypt. Nearby is a broken bowl. There is no mark on either of their bodies and they were not poisoned. How did they die?
- d. A man rode into town on Friday. He stayed three nights and then left on Friday. How come?
- e. Two boxers are in a boxing match. Th fight is scheduled for 12 rounds but ends after 6 rounds, after one boxer knocks out the other boxer. Yet no man throws a punch. How is this possible?