

6. Inductive vs. Deductive Reasoning -

INDUCTIVE REASONING	DEDUCTIVE REASONING
Foundation: Makes no formal assumptions.	Foundation: Begins by making assumptions (axioms, postulates).
Purpose: To uncover a pattern in what is being studied.	Purpose: To discover the ramifications of the assumptions.
Role of Proof: No proof is possible; only verification.	Role of Proof: Logical proof of the discoveries is the goal.
Weakness: It is impossible to test all cases.	Weakness: The reliability of the assumptions cannot be established with complete certainty.
Faith: We trust that the pattern is consistent.	Faith: We trust that the assumptions are reliable.

1. **Example:** The Declaration of Independence states:

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.—That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed, —That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness ...

Does this aspect of the Declaration of Independence exemplify inductive or deductive reasoning?

2. **Example:** Later on, the Declaration of Independence states:

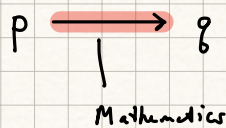
The history of the present King of Great Britain [George III] is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world. [A list of facts follows] ... We, therefore, the Representatives of the United States of America ... appealing to the Supreme Judge of the world for the rectitude of our intentions, do ... solemnly publish and declare, That these United Colonies are, and of Right ought to be Free and Independent States; that they are Absolved from all Allegiance to the British Crown ...

Does this aspect of the Declaration of Independence exemplify inductive or deductive reasoning?

I'll conclude with a poem by Clarence R. Wylie, Jr. (1911-1995), a mathematics professor at Furman University.

Paradox

Not truth, nor certainty. These I forswore
In my novitiate, as young men called
To holy orders must abjure the world.
"If ... , then ... ," this only I assert;
And my successes are but pretty chains
Linking twin doubts, for it is vain to ask
If what I postulate be justified,
Or what I prove possess the stamp of fact.
Yet bridges stand, and men no longer crawl
In two dimensions. And such triumphs stem
In no small measure from the power this game,
Played with the thrice-attenuated shades
Of things, has over their originals.
How frail the wand, but how profound the spell!



BOT Standards: " Students need to understand that while empirical facts are verified by observation, they are established as universally true only by recourse to formal proof. "

Axiomatic System: (Gödel)

- ① Never ending priors → Axioms
 - ② Circular Reasoning → Undefined
- } The fewer of these we have, the more broadly applicable our results.
(Rule of Parsimony or Occam's Razor)