

BWGELA

Introduction to Logic: The Cheat Sheet

A one stop summary of the key ideas, valid forms and fallacies from all three parts of the course. P, Q and R stand for any statements; S and P in categorical statements stand for categories. Keep it beside you when you read, revise or debate.

1. Key Concepts

Part 1

Argument	A set of statements in which some (the premises) are offered as reasons for another (the conclusion).
Deductive argument	Claims that the conclusion follows with certainty from the premises.
Inductive argument	Claims that the conclusion is probable, given the premises.
Valid	A deductive argument in which the conclusion must be true if the premises are true. Validity concerns form, not truth.
Sound	A valid argument whose premises are all true.
Strong and cogent	A strong inductive argument makes its conclusion probable; a cogent one is strong and has true premises.
Counterexample	An argument of the same form with true premises and a false conclusion shows that the form is invalid.

2. Connectives and Conditionals

Part 2

Not P	True when P is false, and false when P is true.
P and Q	True only when both P and Q are true.
P or Q	True when at least one is true (the inclusive or).
If P then Q	False only when P is true and Q is false. P is sufficient for Q; Q is necessary for P.
P only if Q	Means if P then Q.
P unless Q	Means if not Q then P.
Contrapositive	If P then Q is equivalent to if not Q then not P. The converse (if Q then P) is not equivalent.

3. Valid Argument Forms

Part 2

Modus ponens	If P then Q. P. Therefore Q. Example: <i>If the train is cancelled, I will work from home. It is cancelled. So I will work from home.</i>
Modus tollens	If P then Q. Not Q. Therefore not P. Example: <i>If it had rained, the pitch would be wet. The pitch is dry. So it did not rain.</i>
Hypothetical syllogism	If P then Q. If Q then R. Therefore if P then R. Example: <i>If I revise, I pass; if I pass, I graduate. So if I revise, I graduate.</i>
Disjunctive syllogism	P or Q. Not P. Therefore Q. Example: <i>The parcel is at the depot or with the courier. It is not at the depot. So it is with the courier.</i>

4. Formal Fallacies

Part 2

Affirming the consequent	If P then Q. Q. Therefore P. Flawed: <i>If it snowed, the roads are icy. The roads are icy. So it snowed.</i>
Denying the antecedent	If P then Q. Not P. Therefore not Q. Flawed: <i>If you are a doctor, you studied biology. You are not a doctor. So you never studied biology.</i>
Affirming a disjunct	P or Q. P. Therefore not Q (invalid when or is inclusive). Flawed: <i>She speaks French or Spanish. She speaks French. So she does not speak Spanish.</i>
Undistributed middle	The middle term never covers its whole category in either premise. Flawed: <i>All doctors are graduates. Some graduates are runners. So some doctors are runners.</i>
Illicit process	A term covers its whole category in the conclusion but not in the premise where it appears.

5. Categorical Statements

Part 2

A: universal affirmative	All S are P.
E: universal negative	No S are P.
I: particular affirmative	Some S are P.
O: particular negative	Some S are not P.

6. Fallacies of Relevance

Part 3

Ad hominem	Attacking the person instead of the argument. Flawed: <i>Ignore her view on tax; she drives an expensive car.</i>
Straw man	Distorting a view so that it is easier to attack.
Red herring	Changing the subject to distract from the issue.
Appeal to authority	Citing a source who is not an expert on the matter in question.
Appeal to popularity	Assuming a claim is true because many people believe it. Flawed: <i>Millions shared this post, so it must be accurate.</i>
Appeal to emotion	Using feelings such as fear or pity in place of reasons.

7. Fallacies of Presumption and Ambiguity

Part 3

Begging the question	The conclusion is assumed in the premises.
False dilemma	Presenting two options when more exist. Flawed: <i>Either we close the library or the council goes bankrupt.</i>
Slippery slope	Claiming one step will inevitably lead to extreme results, without evidence.
Hasty generalisation	Drawing a broad conclusion from too few or unrepresentative cases.
Loaded question	A question that smuggles in an unproven assumption.
Equivocation	Shifting the meaning of a key word part way through an argument.

8. Evidence, Causes and Probability

Part 3

Correlation is not causation	Two things occurring together does not show that one causes the other.
Confounding factor	A third factor that causes both of the things being compared. Example: <i>Ice cream sales and sunburn both rise in summer: the cause is the sunshine.</i>

Reverse causation	The supposed effect may in fact be the cause.
Gambler's fallacy	Believing past independent events change future odds. Flawed: <i>Red has come up five times, so black is due.</i>
Base rate neglect	Ignoring how common something is when judging a test result or claim.
Weak analogy	Comparing two cases that differ in ways relevant to the conclusion.

9. Five Steps for Any Argument

Everyday logic

Step 1	Find the conclusion: what is the speaker or source trying to make you accept?
Step 2	List the premises, including any hidden ones.
Step 3	Ask whether the reasoning is deductive or inductive, then test its validity or strength.
Step 4	Check whether the premises are true, and look for fallacies.
Step 5	Weigh the evidence proportionately, whether it comes from the news, social media or an AI chatbot.