

Proof Techniques

Mathematics

Six standard shapes of proof, with what each one assumes and produces.

Proving $P \Rightarrow Q$. Pick the shape that fits the hypothesis.

Technique	Assume	Establish
Direct	P	Q follows
Contrapositive	$\neg Q$	$\neg P$ follows
Contradiction	P and $\neg Q$	An absurdity
Induction	$P(k)$	$P(k + 1)$
Exhaustion by cases	Each case in turn	Q in every case
Counterexample	Nothing	One instance failing
Construction	Nothing	Build the object

Contrapositive and contradiction are not the same thing. A contrapositive proof is a direct proof of a logically equivalent statement.