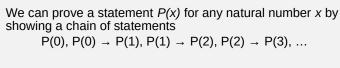
Proof by Induction



Thus, prove

P(0) $\wedge \forall k (P(k) \rightarrow P(k+1))$

proof by induction

CPSC 229: Foundations of Computation • Spring 2024

CPSC 229: Foundations of Computation • Spring 2024

- base case: show P(0)
- inductive case: show $\forall k (P(k) \rightarrow P(k+1))$
 - tactic: let *k* be an arbitrary element of \mathbb{N} and prove $P(k) \rightarrow P(k+1) P(k)$ is the *inductive hypothesis*
 - another tactic: show (P(0) ∧ P(1) ∧ P(2) ∧ ... ∧ P(k)) → P(k+1)

 assume P(x) holds for all x 0 to k, then show P(k+1)

6. Use induction to prove that for any positive integer n, ∑_{i=1}ⁿ(2i - 1) = n² 10. Use induction to prove the following generalized distributive laws for propositional logic: For any natural number n > 1 and any propositions q, p₁, p₂, ..., p_n, a) q ∧ (p₁ ∨ p₂ ∨ ... ∨ p_n) = (q ∧ p₁) ∨ (q ∧ p₂) ∨ ... ∨ (q ∧ p_n) b) q ∨ (p₁ ∧ p₂ ∧ ... ∧ p_n) = (q ∨ p₁) ∧ (q ∨ p₂) ∧ ... ∧ (q ∨ p_n)

