More Induction

CS 103ACE Week 6 – 5/6/24

Agenda:

- Recap: types of inductive predicates
- Understand when to use complete vs. regular induction
- ACE course feedback

Where we are in the quarter

- Everything until now: proof methods
  - Will be on the second midterm in 2 weeks
- Everything starting from last Friday's lecture: theory of computation

Announcements

- It's a busy time of the quarter – remember to breathe
- This week's ACE Office Hours:
  - Monday (today), 1:30 to 3 pm, in Lathrop Library
  - Wednesday 5/8, 4:30 to 5:30 pm, in Lathrop Library
  - Thursday 5/9, 6:30 pm to 8 pm, in Huang Basement
- Midterm grades
  - Raw score calculator spreadsheet: on ACE site under resources
  - Confused about your score? Worried for the rest of the quarter? Want to do better next exam? Check-in: calendly.com/103ace/week6
  - If you are feeling overwhelmed or more stressed than you can handle, **please reach out** – I am here to support you
- Small group feedback today

Complete Induction Template

1. **Restate the theorem with a predicate** P(n).
2. State the **base case** (show P(__) is true) and show it.
3. State the **inductive hypothesis** (pick a k and assume **P(__), ..., P(k) are all true**)
    a. This assumption is the key to complete induction!
4. State the **inductive step goal** (show P(k + 1) is true) and show it.
5. **Conclude** that P(n) is true for all natural numbers!

Problem 3. Complete Induction

Theorem: Every natural number $n > 1$ can be written as the product of one or more prime numbers.

Predicate P(n): n can be written as the product of one or more prime numbers.

Base case: P(2)

Inductive step:

- Reader picks $k > 1$
- Assume P(2), P(3), ..., P(k)
- Prove P(k + 1)