Intro to Proofs Day 15 Outline (This class meets for 110 minutes.)

**Need: Cards**

PART 1: Announcements and Synthesis (0-40 minutes)

**Quiz:** Write a useful negation for the following statement: There exists x in Z such that if y is in Z then y/x is in Z.

**Proof by induction that for each natural number n, 2+5+8+…+(3n-1) = n(3n+1)/2**

* Inductive step: prove that if for some k in N
  + If 2+5+8+….+(3k-1) = k(3k+1)/2
  + Then 2+5+8+…+3(k+1)-1 = (k+1)(3(k+1)+1)/2

(Show adding to both sides of P(k))

**Proof by induction that for each natural number n, 4^n = 1 (mod 3)**

* Inductive step, if for one k in N, 4^n = 1(mod 3), then 4^(n+1) = 1 (mod 3)

**Proof by induction that for each natural number n, 4^n = 1 (mod 3)**

* Errors in the proof – P(n) should be the equality, not just the left half. And they have a 27=43 issue
* How to fix: go down left side and up right side.

PART 2: 40-90 minutes (take a break when you need it)

**Work on Induction Theorems 3 - 5**

PART 3: 90-110 minutes (Fibonacci induction, only if time)