Ordinary Induction vs Strong Induction vs WOP

Always use Strong Induction?

Ordinary is a special case of Strong, so why bother with it?

- helps a reader to know that k's $< n$ don't matter for $n+1$
- more intuitive (?)

Always use Ordinary Induction?

Suppose $\forall m.\ P(m)$ proved by Strong Induction.

Inductive step assumed

$$\forall k \leq n.\ P(k)$$

and proved $P(n+1)$.

Always use Ordinary Induction?

revise induction hypothesis to:

$$Q(n) ::= \forall k \leq n.\ P(k)$$

Now same proof becomes Ordinary Induction.

Ordinary Induction replaces Strong

So Strong Induction adds no power. Just decorate a Strong proof with some $\forall$'s and it becomes Ordinary.

Strong vs. Ordinary

Why use Strong?

cleaner: no need for

$$\forall k \leq n.$$

all over.

WOP vs Induction?

Same deal: easy to rephrase any Induction proof into WOP and vice-versa.

So Induction & WOP are rephrasing of same logical principle. Which to use is a matter of taste.

Why WOP first?

Exam performance & surveys show about 20% of students don't "get" induction. They worry that assuming P(n) is circular and/or they can't do induction proofs. This baffles us and the other 80%.

Why WOP first?

No one has problems believing the WOP, and they have no harder time using WOP than Induction. So to get going on interesting proofs right away, we start with WOP.