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# For me to bring

* blank scratch paper for the kids to practice
* one of those large sheets of posterboard
* all of my printouts of “course materials”
* games:
  + Avalon
  + Coup
  + Chess (2 sets)
  + Equations
  + Dominion

# Big Picture

## Give overview & goals

* teach the sort of math that they are not (yet) getting in class. For now, it’ll be:
  + mathematical logic
  + set theory
  + proofs
* why these topics?
  + they do not require a bunch of earlier knowledge
  + (I think) they take a style of thinking that is so different from normal thinking, that you need some years of practice before the complex stuff becomes innate
* and keep it light & fun
  + we’ll all support each other during the learning portion
  + there is no “required” homework, but fun homework puzzles are optional
  + about ½ of the time will just be fun games with your smart colleagues (the games will try to focus on logic and/or math skills), but primarily be fun.

# Start out with some tough math puzzles

* compare the 1 + ½ + ¼ + … infinite set, and the 1 + ½ + ⅓ + … infinite set, then come back & talk about it
  + break the kids into groups, ideally with the kids who know it or think they know it split apart, so they can teach other others
* then go through the “angel & devil” puzzle:
  + break the kids apart, again into groups with someone who knows it explaining to the others, IF THEY WANT.
  + “There are two gates, one leads to Heaven, the other to Hell. One is guarded by an angel, the other is guarded by a devil (but you don't know which is guarded by whom). Angels and devils look alike, but the angel always tells the truth while the devil always lies. How can you tell which gate is which by asking just one question of only one gate-keeper?”
  + After everyone comes back, ask for the “why”. Why does this solution work? It’s because this solution is the only one with a guaranteed known number of “truths” & “falsehoods”.

# Begin with Mathematical Logic

* Introduce the idea of inductive v. deductive reasoning
  + E.g., “there is smoke, therefore there is fire” v. “there were 20 persons originally, there are 19 now, therefore someone is missing” v. “there were 5 persons originally, Mary got a drink of water, therefore there are only 4 people now”
    - Maybe ask “which is inductive”, to make it a bit more challenging
* Introduce logical constructs:
  + Statements:
    - “There is smoke”
  + Quantifiers:
    - All, none, each, some
    - show the little ven diagram to help explain
  + Connectives:
    - and, or, xor, if, if and only if
* Introduce logical symbols:
  + see what I wrote on the front of “basic concepts of logic” sheet
  + go through the Angel & Devil, but now using logic symbols & terminology
* Explain logical circuits a bit, binary, and how 0 → F and 1 → T. Then go through a half adder, and show how it is the same thing as xor. Then make some silly statements that follow the half-adder.

# Play Games

* Set several games up, explain as needed, and play in whatever game needs more folks to get it moving

# Give Homework

1. Come back Wed with a logic puzzle like the Angel & Devil one, and try to stump the class
2. Come back Wed with the logical circuit for a full adder