Intro to Proofs Day 8 Outline (This class meets for 110 minutes.)

**Section 3.3 worksheet, River crossing/bridge and torch problem**

PART 1: Synthesis Stuff (0-10minutes)

**Section 3.2 #5**

* For all integers a and b, if ab is even then a is even or b is even.
* Prove the contrapositive: For all integers a and b if a is odd and b is odd then ab is odd. (WHY use the contrapositive??)
* Ab=(2x+1)(2y+1) = odd

PART 2: Existence Proofs (10-40 minutes)

* Goal: Think outside of the box. A proof is just an explanation! “Existence Proofs”.

PART 3: Proof by Contradiction (40-60 minutes)

**Discuss Preview Activity (40-45 minutes)**

* Slide 3: There exist integers such that a is even and b is odd and 4 divides a^2+b^2. Just mention leaving the b is odd part.

**Section 3.3 Activity 1 (45-60 minutes)**

* Discuss nuances (Like “let” means “for all”)

---------------------------------------------- BREAK ----------------------------------------------------------

PART 3 (continued): Proof by Contradiction (70-110 minutes)

**Discuss more of the Preview Activity [ 70-85]**

* What’s a contradiction? Show answers!
* Examples of contradictions: a is even and odd. A is congruent to 0 mod 3 and 1 mod 3. We know x is positive but we show it’s 0. X^2<0. Contradict a hypothesis – we assume that a and b have no common factors greater than 1, show that they do.
* Do example of proof by contradiction:
  + For all real numbers x and y, if x is not equal to y, x>0, y>0 then x/y + y/x>2.

**Section 3.3 Activity 2/3 [85-110]**

Preview Activity for next time: Proof by cases and division algorithm and questions for midterm exam

Synthesis activity for next time: Section 3.2 #9, Section 3.2 #14a, Section 3.3 Progress Check 3.15, Section 3.3 Progress Check 3.18