Intro to Proofs Day 16 Outline (This class meets for 110 minutes.)

**Need: 6.1-6.2 worksheet, notecards with words “domain, codomain, range, image, preimage” (5 sets)**

PART 1: Announcements and Synthesis (0-20 minutes)

**Mention Mosaic Lecture**

**Section 5.2 #3: A={x in Z: x =7 (mod 8)}, B = {x in Z: x =3 (mod 4)}**

* A = { …-9,-1,7, 15, 23,…} B = { …,-5,-1,3, 7, 11, 15,…}
* A is a subset of B. If x is in A then x = 7 (mod 8) or x = 8a+7 for some a. Then x = 8a+4+3 = 4(2a+1)+3. So x = 3 (mod 4).
* B is not a subset of A since 3 is in B, and 3 is not in A.

**Section 5.2 #5c: A = {x in Z: x = 1 (mod 5)}, B = {y in Z : y = 7 (mod 10)}**

* A = { …,-4,1,6, 11, 16,…}, B = {…,-7,7, 17, 27,….} So A intersect B is the empty set.
* Contradiction: Suppose x in A intersect B. Then x = 1 (mod 5) and x = 7 (mod 10). Then x = 5a+1 and x = 10b+7. So 5a+1 = 10b+7 so 5a-10b = 6 or 5(a-2b)=6 which means 5 divides 6, a contradiction.

**Section 5.3 #3 Show (A intersect B)^c = A^c U B^c**

* Suppose x in A intersect B complement. Then x is not in A intersect B. So x is not in A or x is not in B. Two cases. If x is not in A then x in A^c so x in A^c U B^c. If x is not in B then x is in B^c so x in A^c U B^c.
* Suppose x in A^c U B^c. Then x in A^c or x in B^c. If x in A^c then x is not in A, so x is not in A intersect B. So x is in A intersect B^c. Similar for x in B^c.

PART 2: End of Set Theory (20-35 minutes)

**Do this proof together as a class.**

* They do 1-3 on last page of Chapter 5 worksheet
* Work through proof together as a class once everyone has a conjecture

PART 3: Functions- go over preview activity/use terminology (35-55 minutes)

**Go over Preview Activity**

*Notes:*

* Write on board: A **function** from a set A to a set B is a rule that associates with every element of x of the set A exactly one element of the set B.
* Slide 3: Which ones are functions? Two important properties: every real number can be put through the process to obtain an output and the outcome of the process is unique.
  + Talk about table first. Draw an arrow diagram as a set up for first activity.
  + Then talk about birthday. Takes a person, then they only have one birthday, so outcome of the process is unique.
  + Then talk about “inverse”
* Slide 4: Difference between codomain and range. Draw an arrow diagram to describe.
* Slide 5-7 see snapshots

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* They draw arrow diagrams. For each one a person should select a card and use that word in a sentence about the function.

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

PART 4: Expanding function knowledge (65-90)

* They work on pages 2-4 of Section 6.1-6.2 worksheet

PART 5: Quiz (90-110)

Preview activity for next time: injections/surjections

Synthesis for next time: Section 6.1 #6 on pages 292-293