MATH 2590 - ASSIGNMENT 5

NOVEMBER 30, 2010

(1) Fill out the online evaluation for this course at:

http://courseevaluations.yorku.ca

Please provide as much feedback on this course as you can. What you liked. What you didn't like. What you thought was helpful. What you thought this course was going to be about. What you felt this course actually was about. What you wish we would have covered. What you wish we hadn't covered.

(2) For the following problems I don't want you to hand in all of them but try as many as you can. The first 5 were probems that I found on the internet as typical word problems that are given to high school students about modular arithmetic. I will do number one in class. I will then ask you to get in groups and work together to solve these properly. Find your student ID $(mod\ 5)$ (this will be a number between 0 and 4) and then add 2 to it. Find your student id number $(mod\ 3)$ (as a number between 0 and 2) and then add 7 to it.

Word problems. Do the problems below that correspond to your answer from problem (2) above. Problems (1)-(6) can use something called "Chinese Remainder Theorem" which is a formula for solving systems of modular equations. That theorem works great if you are going to do some large scale applications, but for word problems like these it is best to solve a pair of equations at a time $x \equiv a\ (mod\ m)$ and $x \equiv b\ (mod\ n)$ by going back to the definition. $x = a + jm$ so plug this into the second equation $a + jm \equiv b\ (mod\ n)$. Now figure out the possible values of j by solving this equation and plugging in j back into $x = a + jm$. I will show you how to do this for problem #1 in class.

(1) If eggs in a basket are taken out 2,3,4,5 and 6 at a time, there are 1,2,3,4, and 5 eggs left over, respectively. If they are taken out 7 at a time, there are no eggs left over. What is the least number of eggs that can be in the basket?

(2) I'm thinking of a number between 1 and 10000. When I divide this number by 11, 12, 13 and 14, then I get remainders of 4, 4, 8 and 6. What is the number?

(3) An ancient Chinese problem asks for the least number of gold coins a band of 17 pirates could have stolen. The problem states that when the pirates divided the coins into equal piles, 1 coins were left over. When they fought over who should get the extra coins, one of the pirates was slain. When the remaining pirates divided the coins into equal piles, 13 coins were left over. When the pirates fought again over who should get the extra coins, another pirate was slain. When they divided the coins in equal piles again, 8 coins were left over. How many coins were there?

Date: due December 7, 2010.

(4) Chinese generals used to count their troops by telling them to form groups of some size n, and then counting the number of troops left over. Suppose there were 10000 troops before a battle, and after the battle it was found that when the troops formed groups of 5 there was 2 left over, when they formed groups of 7 there were none left over, when they formed groups of 11 and 17 there were 9 left over. How many troops survived the battle?

(5) Three farmers equally divide the rice that they have grown. One goes to a market where an 83-pound weight is used, another to a market that uses a 112-pound weight, and the third to a market using a 135-pound weight. Each farmer sells as many full measures as possible, and when the three return home, the rst has 32 pounds of rice left, the second 75 pounds, and the third 30 pounds. Find the total amount of rice they took to market.

(6) On a recent trip to Mars we declared the first day we arrived to be Sunday and started our calendar from there and every month had 30 days. One day I asked, "How long have we been here?" The answer was: "I don't know, but it is a Wednesday and it is the 6th day of the month." If we were there less than a year, can you determine how many days since we first arrived?

(7) I went to London to celebrate the engagement of Kate and William There is a 5 hour difference (they are ahead) in the time. The plane was supposed to leave at 9pm, but there was a three hour delay. We arrived at 1pm the next day. How long were we in the air?

(8) The country of Bernoulli has a standing army of 824,639 soldiers. It has a trained reserve of 3,206,892 soldiers. Both the active and reserve forces are organized into battalions. All battalions are of the same size (standing army or reserve), and every battalion has its full complement of soldiers (every soldier is in a battalion). What is the greatest number of soldiers in a Bernoulli Battalion?

(9) Can the numbers 1 through 25 be proportioned into two or more subsets so that the product of each of the numbers in the subset is the same? Why or why not?