

CISC-203

20200106

"Mental Arithmetic"

Me: Let's warm up our brains. Somebody start the calculator app on their phone. Three people, please give me digits to make a number.

Class members: "4", "7", "3" (these were not the actual digits given ... I have forgotten them)

Me: Ok, now I'll make a 6-digit number by repeating those, so we get 473473, Hmmmmm, that divides evenly by 11.

Calculator person: Correct!

Class: Wow, that's amazing!

Me: Another one?

Class members: "8" ... "6" ... "3" (or something like that)

Me: Ok, 863863 divides by ... 7

Calculator person: Yes it does.

Class: This is incredible!

Class members: "5" ... "8" ... "7" (I know this wasn't the number named, but it might have been)

Me: Right, 587587. Um, 75 in the middle, 8 there, ... I think ... no ... ok, that divides by 91.

Calculator person: Yes!

Class: We've never seen such skills!

Me: This time, we'll make it four digits.

Class members: "5" ... "5" ... "5" ... "6" (or something)

Me: 55565556 Ok, three 5's and the 6 between two 5's ... that number divides by 137

Calculator person: Right!

Class: Stop, stop, you are scaring us with your unearthly powers.

Me: Thank you, thank you, thank you for that tremendous applause.

Well it went something like that in my imagination, anyway. The reality was that the class did not seem all that impressed – oh well, I think it's a good party trick!

The secret is that I was not using mad arithmetic skills to factor these large integers in my head. In fact, I was using a skill that everyone in the class already possesses. I will reveal the secret eventually ... but I won't put it in the notes! (Yes, this a blatant ploy to get people to attend class.)

It's an illustration of one of the themes of this course – there is power in patterns.

If you can't wait, here's a hint: the integer $abcabc$ always divides evenly by abc ... what is the value of $\frac{abcabc}{abc}$?

We spent some of the remaining class-time discussing the structure of the course, the course website, the marking scheme, the text book etc.

But then we turned to something a lot more interesting: the famous Josephus Problem. We spent all the next class talking about this problem so I will defer the definition of the problem until the next page of notes.