**Class dates/deadlines**

For all pre-class/class activity work, please feel free to add thoughts/comments/questions in response to others’ work. I don’t want to be the only odd one asking all questions/adding thoughts :) I admit, I do talk a lot, but when it’s so in my face, I feel bad :P

Week 1

Pre-class: by the end of June 9

Class activity: To be discussed on June 15 class meeting, at 5 pm

<https://meet.google.com/mvg-xifz-wzc>

Homework: by the end of June 21

Week 2

Pre-class: by the end of June 18

Class activity: If you’d like to put work in, please do that by 12 pm on June 22.  
To be discussed during the June 22 class meeting, at 5 pm. Same code as last week.

Homework: by the end of June 28

Week 3

Pre-class: by the end of June 24 \*\*\*Changed, to give myself more time to review pre-class.

Class activity: If you’d like to put work in, please do that by 12 pm on June 29.  
To be discussed during the June 29 class meeting, at 5 pm.

Homework: by the end of July 5

Week 4

Pre-class: by the end of July 1

Class activity: If you’d like to put work in, please do that by 12 pm on July 6.  
To be discussed during the July 6 class meeting, at 5 pm. If we do any breakout rooms, here are their links:  
Breakout room 1 <https://meet.google.com/xfj-nwuh-ezy>

Solve for all x modulo g inverse of 45 modulo 4579.

Breakout room 2 <https://meet.google.com/ikg-nqig-gqc>

Solve for all x modulo 54811: 27199x=236 mod 54811

Find inverse of 47 modulo 4709.

Breakout room 3 <https://meet.google.com/ikg-nqig-gqc>

Solve for all x modulo 62779: 31289x= 268 mod 62779

Find inverse of 47 modulo 4771.

Homework: by the end of July 12

Midway evaluation form (anonymous):

<https://forms.gle/9iwCQ5PpkrBCZFBN8>

Week 5

Pre-class: by the end of July 8

Class activity: If you’d like to put work in, please do that by 12 pm on July 13.  
To be discussed during the July 13 class meeting, at 5 pm.

Homework: by the end of July 19

Week 6

Pre-class: by the end of July 15

Class activity: If you’d like to put work in, please do that by 12 pm on July 20.  
To be discussed during the July 20 class meeting, at 5 pm.

Homework: by the end of July 26

Week 7

Pre-class: by the end of July 22

Class activity: If you’d like to put work in, please do that by 12 pm on July 27.  
To be discussed during the July 27 class meeting, at 5 pm.

Let’s try a Zoom meeting to see if that will kick me out:  
<https://gvsu-edu.zoom.us/j/99060336601?pwd=WHkvRnJtSWNiVDZNeVhkT2JwejlOQT09>

Password is 244264.

Homework: by the end of August 2

Week 8

Pre-class: by the end of July 29

Class activity: If you’d like to put work in, please do that by 12 pm on August 3.  
To be discussed during the August 3 class meeting, at 5 pm.

Homework: by the end of August 9

Project guidelines and topics:

Project should be about 4 pages, not counting pictures or large tables (can definitely go past 4 pages, but should not be less than 3 pages). Assume a mathematically mature audience, someone who has completed calculus, linear algebra and the proofs course (and discrete math, if you are going to use any related results). I prefer a Google document file, but PDF is OK too. Any outside sources should be referenced. I’m not an English teacher, so no strict requirements (like “no run on sentences, make sure to use Oxford comma, etc.”), but the reading should make sense and be easy to follow. I get confused too easily, so make sure to define things precisely and give clear examples as well.

* Famous number theory problems, such as:

Mersenne prime conjecture

Fermat's Last Theorem

Odd perfect number conjecture

Fermat prime conjecture

Prime number theorem (uses limits)

Primes in arithmetic progression

Collatz problem (I think this is more of a discrete dynamical systems problem than a number theory problem, but it's still cool)

Primes of the form (I'm not sure if there's enough to talk about)

Suggested outline for the project if this option is chosen:  
The result: So, what is the conjecture/result? Give an easy example to explain what the result is

about. For example, if the result is about perfect numbers, define what they are and give a few examples. Create your own perfect number or justify why a number you found in a book/web page is perfect.

History: Who originally came up with this problem? Who in the past contributed to the problem

since then? What were the rst results? For example, if the result is named after a person, what was the person's contribution?

Recent results: Are there recent results found? What techniques are being used (if accessible)? If the conjecture is about many cases, is one case easy to prove? If so, can you give a sketch of the proof of that easy case? For a conjecture, you might want to mention the largest number of n they have verified the conjecture up to. There are such results obtained using computer search techniques for some of these results. You can also mention related results, that either would follow from the result you're talking about or would imply the result.

* Divisibility Rules and Number Tricks

Suggested outline for the project if this option is chosen:  
The rule/trick: So, what is the divisibility rule/number trick? You can choose base 10 trick, or

create a generalization of a base 10 trick to other bases. Give an easy example that everyone can follow easily. Then apply the rule/trick to something more complicated to show how it can be useful. For example, if the rule is for divisibility by 2, describe how it works in general and apply it to one small example, say 26. Then include a more complicated example, such as 1121716. (Of course, divisibility by 2 is too simply to do a report on, as mentioned below.)

The mathematics behind the rule/trick: Using algebra and/or modular arithmetic, describe why the rule/trick works always. For example, to describe why the rule for divisibility by 2 works, we can say “Suppose a number is written in the form in base 10 where is the 1's digit, is the 10's digit, etc. Then this number equals Since 10 is divisible by 2, the number is divisible by 2 if and only if is divisible by 2. Hence the rule for divisibility by 2 works by looking at the last digit only."

Which divisibility rules are OK: For the project, choosing divisibility by 2 or 5 in base 10 is too simple, so you have to choose something a bit more complicated. If you choose divisibility by 3, that’s also too simple, but maybe 3 and 9 together might work. I would still prefer something more complicated. Here’s the link to the article with a lot of divisibility rules:  
<http://www.dehn.wustl.edu/~blake/courses/WU-Ed6021-2011-Summer/handouts/Marc%20Renault%20-%20Stupid%20Divisibility%20Tricks.pdf>

* Real-life applications of number theory

RSA encryption algorithm

Affine and Hill ciphers

Die-Hellman key exchange and how public key ideas were initially developed

ElGamal encryption

Digital signatures

Error-detection and correction, including ISBN coding and credit card numbers

Pseudorandom number generators (at least two di  
erent types have to be covered)

Primality testing

Any other applied topic of your choice.