

MATH 1300, Mathematical Explorations

Big Numbers

Activity

- Pass out an index card to each student and give them two minutes to write the following on their card: Using standard math notation, English words, or both, name a single whole number - not an infinity - on a blank index card. Be precise enough for any reasonable modern mathematician to determine exactly what number you've named, by consulting only your card and, if necessary, the published literature. (Alternatively, you could ask them to name the largest whole number they can.)
- Collect the cards and discuss the results as a class.
- Discuss examples of exponential growth: Moore's Law, unfettered population growth, corona virus case rates, etc.
- Introduce the Hercules and the Hydra problem. Start with two letters. Who wins? How many steps in some examples? a^n example (in 2-letter hydra). What do you wonder? Does Hercules always win? How to prove it? What about more letters?.... Does Hercules still always win? Steps to kill a^3 with hydra on 3 letters (answer 46)?
- Discuss Berry Paradox.
- Give students 10 second to write down a guess, then collect the answers and read them out: How long is a million seconds? How long is a billion seconds? Then give students time to calculate: a million seconds = 11.6 days, a billion seconds = 31.7 years
- Discuss Terry Tao's federal budget rescaled
- Other examples/ways to get to grips with big numbers
 - Solar system (The Sagan Walk in Ithaca - See Steve's NYT essay)
 - Subatomic scales
 - Time
 - Personal wealth
- Discuss problems with all this (distortion from dimension effects?)

References and resources

[Wikipedia: Moore's Law](#)

[Video: Kill the Mathematical Hydra](#)

[Andrej Bauer: The Hydra Game](#)

[Wikipedia: Berry Paradox](#)

[Terry Tao's Federal Budget Rescaled](#)

[Strogatz NYTs Article: Visualizing Vastness](#)