

UW Math Circle

October 23, 2014

1. Remember that $n! = 1 \times 2 \times 3 \times \cdots \times n$, and $0! = 1$. $10! = 3628800$ ends with 2 zeroes. How many zeroes does $99!$ end with? How about $2015!$?
2. When you add up all the digits of a number, you get what is called the *digital sum* of that number. For example, the digital sum of 345 is 12. John wants to start with a number and repeatedly take its digital sum until he gets to just one digit. For example, if he started with 345, he would get 3. What would John get if he started with 23487^{2398} ?
3. Remember that a twin prime pair are prime numbers that differ by 2, for example 11 and 13. Except for 3 and 5, prove that the sum of any twin prime pair is divisible by 12.
4. Can you find 10 composite numbers in a row? How about 100? 10000?
5. Come up with a divisibility rule for 13, similar to the one we discussed for 7. Make sure it works by testing it on 3159.

Done already? Try figuring out what's going on in this image.

