UW Math Circle
April 30, 2015

1. Find $\gcd(12n + 1, 30n + 2)$.

2. Find the last digit of $1^2 + 2^2 + 3^2 + \cdots + 99^2$.

3. For a number n, can the number $n!$ have exactly 5 zeros at the end of its decimal representation? What about 6 zeros?

4. Find $\gcd(111\ldots 111, 11 \ldots 11)$, where there are 100 1's in the first number and 60 1's in the second.

5. Find all solutions to the equation $173x + 1990y = 11$.

6. If p and $p^2 + 2$ are prime numbers, show that $p^3 + 2$ is also a prime number.

7. Challenge: If $n = \dfrac{a}{b}$ for integers a and b, prove that the decimal representation of n either terminates or eventually repeats.