# UW Math Circle
October 16, 2014

1. There are 4 light switches that all turn the same light on and off. Initially, one light switch is flipped on while the remaining 3 are turned off. Is it possible to turn all the light switches off if you must switch two of them on or off at a time?

2. How many configurations of light switches are there in the problem above? (One configuration is something like off, off, on, off.)

3. Jill's school is having a giant pizza party to celebrate winning the Intergalactic Math Battle. They ordered 2 very big pepperoni pizzas to celebrate. They even have a very special pizza knife that always cuts one piece of pizza into 3 or 5 pieces. If 239 people go to Jill's school, is it possible to cut exactly 239 pieces of pizza?
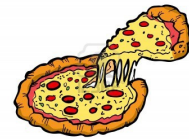
4. Take any six consecutive numbers (by consecutive, we mean one after another, like 6, 7, 8, 9, 10, 11). Let a be the sum of the first three numbers and b be the sum of the last three numbers. Is it possible for ab to equal 999999?

5. How many 4-letter words can we form such that each word has 4 different letters in increasing alphabetical order? (Note that these "words" don't have to be real words, for example abcd would count, and so would admz, but not zbca.)

6. Show that 2015 cannot be written as the sum of two squares (i.e. we can't write $2015 = a^2 + b^2$). How about 20000000015?