University of Washington Math Hour Olympiad, 2018

Grades 8-10

1. Five children, Aisha, Baesha, Cosha, Dasha, and Erisha, competed in running, jumping, and throwing. In each event, first place was won by someone from Renton, second place by someone from Seattle, and third place by someone from Tacoma. Aisha was last in running, Cosha was last in jumping, and Erisha was last in throwing.

Could Baesha and Dasha be from the same city?

2. Fifty-five Brits and Italians met in a coffee shop, and each of them ordered either coffee or tea. Brits tell the truth when they drink tea and lie when they drink coffee; Italians do it the other way around.

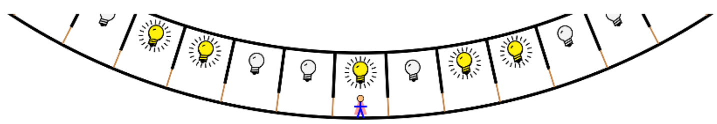
A reporter ran a quick survey:

Forty-four people answered "yes" to the question, "Are you drinking coffee?"
Thirty-three people answered "yes" to the question, "Are you Italian?"
Twenty-two people agreed with the statement, "It is raining outside."

How many Brits in the coffee shop are drinking tea?

3. Doctor Strange is lost in a strange house with a large number of identical rooms, connected to each other in a loop. Each room has a light and a switch that could be turned on and off. The lights might initially be on in some rooms and off in others.

How can Dr. Strange determine the number of rooms in the house if he is only allowed to switch lights on and off?



4. Fifty street artists are scheduled to give solo shows with three consecutive acts: juggling, drumming, and gymnastics, in that order. Each artist will spend equal time on each of the three activities, but the lengths may be different for different artists. At least one artist will be drumming at every moment from dawn to dusk.

A new law was just passed that says two artists may not drum at the same time. Show that it is possible to cancel some of the artists' complete shows, without rescheduling the rest, so that at least one show is going on at every moment from dawn to dusk, and the schedule complies with the new law.

5. Alice and Bob split the numbers from 1 to 12 into two piles with six numbers in each pile. Alice lists the numbers in the first pile in increasing order as $a_1 < a_2 < a_3 < a_4 < a_5 < a_6$ and Bob lists the numbers in the second pile in decreasing order $b_1 > b_2 > b_3 > b_4 > b_5 > b_6$. Show that no matter how they split the numbers,

$$|a_1 - b_1| + |a_2 - b_2| + |a_3 - b_3| + |a_4 - b_4| + |a_5 - b_5| + |a_6 - b_6| = 36$$