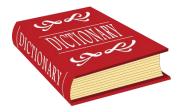# University of Washington Math Hour Olympiad, 2017

Grades 6-7

1. Ten children arrive at a birthday party and leave their shoes by the door. All the children have different shoe sizes. Later, as they leave one at a time, each child randomly grabs a pair of shoes their size or larger.

After some kids have left, all of the remaining shoes are too small for any of the remaining children. What is the greatest number of shoes that might remain by the door?

2. Turans, the king of Saturn, invented a new language for his people. The alphabet has only 6 letters: A, N, R, S, T, U; however, the alphabetic order is different than in English. A word is any sequence of 6 different letters. In the dictionary for this language, the first word is SATURN. Which word follows immediately after TURANS?

3. Benji chooses five integers. For each pair of these numbers, he writes down the pair's sum. Can all ten sums end with different digits?

4. Nine dwarves live in a house with nine rooms arranged in a 3×3 square. On Monday morning, each dwarf rubs noses with the dwarves in the adjacent rooms that share a wall. On Monday night, all the dwarves switch rooms. On Tuesday morning, they again rub noses with their adjacent neighbors. On Tuesday night, they move again. On Wednesday morning, they rub noses for the last time.

Show that there are still two dwarves who haven't rubbed noses with one another.

5. Anna and Bobby take turns placing rooks in any empty square of a pyramid-shaped board with 100 rows and 200 columns. If a player places a rook in a square that can be attacked by a previously placed rook, he or she loses. Anna goes first.

Can Bobby win no matter how well Anna plays?