

# University of Washington Math Hour Olympiad, 2018

## Grades 6-7

1. Alice and Bob played 25 games of rock-paper-scissors. Alice played rock 12 times, scissors 6 times, and paper 7 times. Bob played rock 13 times, scissors 9 times, and paper 3 times. If there were no ties, who won the most games?



(Remember, in each game each player picks one of rock, paper, or scissors. Rock beats scissors, scissors beat paper, and paper beats rock. If they choose the same object, the result is a tie.)

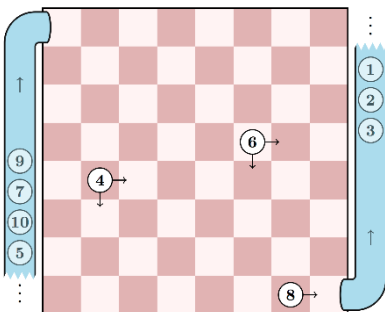


2. On the planet Vulcan there are eight big volcanoes and six small volcanoes. Big volcanoes erupt every three years and small volcanoes erupt every two years. In the past five years, there were 30 eruptions. How many volcanoes could erupt this year?

3. A *tangle* is a sequence of digits constructed by picking a number  $N \geq 0$  and writing the integers from 0 to  $N$  in some order, with no spaces. For example,  $010123459876$  is a tangle with  $N = 10$ . A *palindromic* sequence reads the same forward or backward, such as 878 or 6226. The shortest palindromic tangle is  $0$ .

How long is the second-shortest palindromic tangle?

4. Balls numbered 1 to  $N$  have been randomly arranged in a long input tube that feeds into the upper left square of an  $8 \times 8$  board. An empty exit tube leads out of the lower right square of the board. Your goal is to arrange the balls in order from 1 to  $N$  in the exit tube. As a move, you may



1. move the next ball in line from the input tube into the upper left square of the board,
2. move a ball already on the board to an adjacent square to its right or below, or
3. move a ball from the lower right square into the exit tube.

No square may ever hold more than one ball. What is the largest number  $N$  for which you can achieve your goal, no matter how the balls are initially arranged? You can see the order of the balls in the input tube before you start.

5. A  $2018 \times 2018$  board is covered by non-overlapping  $2 \times 1$  dominoes, with each domino covering two squares of the board. From a given square, a robot takes one step to the other square of the domino it is on and then takes one more step in the same direction.

Could the robot continue moving this way forever without falling off the board?

