

# University of Washington Math Hour Olympiad, 2024

## Grades 6–7

**Problem #1** There are 2024 parakeets in the Rainbow Forest. Each one either always tells the truth or always lies. Four of the parakeets say:

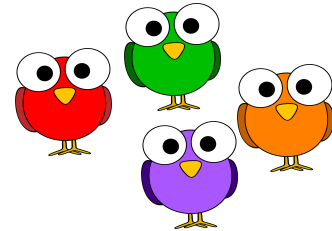
Polly: "There are no blue parakeets in the forest."

Molly: "Polly is blue."

Dolly: "Polly is not blue."

Holly: "There are more liars than truth-tellers among the four of us."

Are there any blue parakeets in the forest?



**Problem #2** Arturo needs to move six paintings by different artists between floors in a museum:

Paul's painting: Floor 4 to Floor 9

Yayoi's painting: Floor 2 to Floor 7

Frida's painting: Floor 4 to Floor 1

Leonardo's painting: Floor 7 to Floor 4

Rene's painting: Floor 2 to Floor 4

Georgia's painting: Floor 8 to Floor 2

The paintings can be moved in any order, but the elevator can only hold one painting at a time. Arturo starts and ends on Floor 1. What is the smallest number of floors he can travel and deliver all the paintings to their desired destinations? (For example, if he takes the elevator from Floor 1 to Floor 7, then from Floor 7 to Floor 3, he has traveled  $(7 - 1) + (7 - 3) = 10$  floors.)

**Problem #3** There are 100 lights in a circle, all initially turned off. You can turn on lights one at a time. If you turn on a light and both of its neighbors are already on, you must turn off exactly one of its neighbors immediately. If only one neighbor is on, then that neighbor must immediately be turned off.

What is the maximum number of lights that can be turned on at the same time?

**Problem #4** The squares of a  $101 \times 101$  dance floor must be colored red, green, and blue. No two squares that share a side are allowed to have the same color.

Cinderella suggests a coloring which alternates red, green, and blue diagonals as shown. Drizella suggests a coloring that is different from Cinderella's at each of the 400 squares on the perimeter. Show that Drizella's coloring is different from Cinderella's at every square.

R	G	B	R	...
G	B	R	G	...
B	R	G	B	...
R	G	B	R	...
...	...	...	...	...



**Problem #5** Pirate Jim has 10 chests that all contain different numbers of gold coins. In total there are 1000 coins.

Every hour, Pirate Jim takes 9 coins from the chest that contains the largest number of coins and puts one coin into each of the other chests.

Pirate Jim must stop if any two chests have the same number of coins. Is it possible that Pirate Jim will never stop moving coins?