University of Washington Math Hour Olympiad, 2024

Grades 8–10

Problem #6 The kingdom of Binaria produces coins worth 1, 2, 4, 8, 16, 32, and 64 cents. A banker wishes to count out 99 cents using any combination of coins. Is the number of ways this can be done even or odd?

Problem #7 Jugglers from around the world will travel to Jakarta to participate in the Jubilant Juggling Jamboree. The Jamboree lasts all 31 days of July.

A schedule for the Jamboree is called *joyful* if no two days feature the same (possibly empty) set of jugglers.

The organizers arrange a joyful schedule with 31 jugglers. Then they learn that one juggler must be sent to Bali for the Ball Bouncing Bonanza. Given any initial joyful schedule, can the organizers always pick one juggler to remove, without changing the rest of the schedule, so that the final schedule remains joyful?