

Warm-Up: Mario Kart

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Instructor's Handout

This handout contains solutions and notes.

Recompile without solutions before distributing.

Problem 1:

A standard Mario Kart cup consists of 12 players and four races.

Each race is scored as follows:

- 15 points are awarded for first place;
- 12 for second;
- and $(13 - \text{place})$ otherwise.

In any one race, no players may tie.

A player's score at the end of a cup is the sum of their scores for each of the four races.

An n -way tie occurs when the top n players have the same score at the end of a round.

What is the largest possible n , and how is it achieved?

Solution:

A 12-way tie is impossible, since the total number of point is not divisible by 12.

A 11-way tie is possible, with a top score of 28:

- Four players finish 1st, 3^{ed}, 11th, and 12th;
- Four players finish 2nd, 4th, 9th, and 10th;
- Two players finish fifth twice and seventh twice,
- One player finishes sixth in each race.

The final player always finishes eighth, with a non-tie score of 20.