

# 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 1<sup>st</sup>, 3<sup>rd</sup>, 11<sup>th</sup>, and 12<sup>th</sup>;
- Four players finish 2<sup>nd</sup>, 4<sup>th</sup>, 9<sup>th</sup>, and 10<sup>th</sup>;
- 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.