You Will Need:

- One to four players
- A Race Track on grid paper
  
  *A Race Track is provided for you on the second to last page. You are also given a blank grid on the last page where you can create your own track!*

- A different coloured pen or pencil for each player.
  
  *Since you are likely to play this game multiple times, you may want to place the Race Track inside a sheet protector and then use dry erase markers to play instead. If you do not have a sheet protector, try using clear tape to create an erasable surface for the track.*

How to Play:

1. Start with a Race Track.
2. Players take turns. Decide which player will go first, second, and so on.
3. To start the game, each player must place their “car” at a different place on the starting line. Players can do so, one at a time, based on the chosen order of the players.

   *Placing your “car” on the starting line actually means drawing a dot on top of one of the grid points lying on the starting line. Each player needs to place their car on a different grid point. You can place your car on the boundary of the track.*

4. On each turn, the current player will move their car according to the allowed moves in the game.

   *Moving your car means placing a new dot at a new grid point on the track. See below for a description of the rules allowed in the game.*

5. The winner is the first player to complete a lap, that is, the first player whose car crosses the finish line.

Allowed Moves

All moves must be from one grid point to another grid point. Each grid point has eight neighbouring grid points as shown to the right.

From the starting line, each player’s first move must be moving their car to one of the eight neighbours of their starting position.

For all subsequent moves, players must move their car the same distance in the same direction as their previous move, or to one of the eight neighbours of that final position. For example, if arrow $AB$ represents the player’s previous move as shown to the right, then on this player’s next turn, they can move their car either to the spot marked with a red $\times$, or to any of the eight neighbours of the point with a red $\times$, each marked with a blue $\times$.

*Notice that a move from $B$ to the red $\times$ is represented by an arrow that is the same length and in the same direction as the arrow from $A$ to $B$.*

A car cannot be moved to a grid point where another car is already located.
Here is an example of a two player game on a simple Race Track.

Player 1 (P1) goes first.
Player 2 (P2) wins in 6 moves.

Here is an explanation of Player 2’s first four moves in the sample game above.

**First Move**
P2 can move their car to any of the eight locations marked with an \( \times \). P2 chooses to move one grid point to the right. Note that P2 could move backward, but this may not be the best choice if P2 is hoping to complete a lap quickly. (Moving backwards to a finish line does not count!)

**Second Move**
Since P2’s previous move was one grid point to the right, we place the red \( \times \) one grid point to the right of P2’s current position. P2 can move to this \( \times \) or any of the eight locations surrounding it. P2 moves two grid points to the right.

**Third Move**
Since P2’s previous move was two grid points to the right, we place the red \( \times \) two grid points to the right of P2’s current position. P2 can move to this \( \times \) or any of the eight locations surrounding it. P2 moves three grid points to the right and one grid point down.

**Fourth Move**
Since P2’s previous move was three to the right and one down, we place the red \( \times \) three to the right and one down from P2’s current position. P2 can move to this \( \times \) or to some of the eight locations surrounding it. P2 moves four grid points to the right.

**Dealing with the Boundary**
During the game, there may be a time when a player has no choice but to move their car onto or through a boundary line of the Race Track on their turn (as shown to the right). If this happens, then the player places their car at the grid point nearest to where their move touched the boundary (as shown by the red dot). On this player’s next turn, they move their car to one of the eight neighbours of their current place (red dot) that lies inside the track (shown with black dots).

**Let’s Play!**
Play this game a number of times using the track given on the next page. Alternate which player goes first. Were you able to figure out how to avoid hitting a boundary of the Race Track?

**More Info:** A vector is defined as a quantity which has both a magnitude and a direction. In Race Track, each move can be represented by a vector. To learn more about vectors see this Math Circles lesson.
Sample Race Track
Make Your Own Race Track!

*You can use your own grid paper or the grid below. Add some sharp corners for an extra challenge!*