Making Math

Developing Student Mathematicians

Race Track – A Cartesian Strategy Game

This game was popularized by Martin Gardner in a 1973 column in Scientific American and is also published as “Sim, Chomp, and Racetrack” in Gardner, Martin (1986). Knotted Doughnuts and Other Mathematical Recreations. New York, N.Y.: W. H. Freeman and Company, 109-122.

Learning Objectives: Race Track serves several purposes. Initially, it is an entertaining opportunity for exercising logical planning and problem-solving abilities. Additionally, it provides a setting in which students will become familiar with the directed numbers of Cartesian graphing and the horizontal and vertical components of slopes. Because this game is also a good introduction to vectors, it enables students to learn about slope as a property independent of location. Doing a very short track with the students on the board should clarify most issues. After that, just keep an eye out for students who think that 1 to –1 is one step or who ignore the acceleration rule altogether. You can usually spot this by tracks that don’t look relatively smooth in their turning without slowing down to small vectors.

Notes:

- The student handout includes instructions (which can be confusing, so work through examples together first) and then the three pages that follow include two practice tracks (in order of difficulty) and a blank grid that students can use for drawing their own tracks.
- Students often treat slopes (and their signs especially) in a haphazard fashion. Use of this game prior to the formal examination of linear functions gives them a context in which these sign distinctions have some significance.
- A lot of interesting mathematics can come out of attempts to determine the minimum number of moves necessary to complete even very simple tracks. For example, a formula for the number of moves needed to complete a straight track that is *n* boxes long is not obvious but can be found by a

motivated algebra student. The problem can be well understood by a middle school student in terms of the arithmetic involved.

- There are many possible variations of the game including oil slicks (regions on the track which, if your path passes through them, don't permit any change in velocity for the turn that intersects the patch (you have to maintain the same horizontal and vertical speeds).
- Students can play the game solitaire and just work on completing a track in fewer turns (or at all, if they crash initially).