1035-Z1-185   **Allan Alexander Struthers*** (`struther@mtu.edu`), Math Sci, Mich Tech, 1400 Townsend Drive, Houghton, MI 49930. *Loaded Dice and Dreidels.* Preliminary report.

Most coins and dice are (with some confidence level) fair with minor asymmetry and manufacturing imperfections not significantly disrupting their nominally equal probabilities. In contrast, dreidels (six sided tops used in children's games) are very sensitive to minor imperfections even though they appear to spin normally. These spinners are spun clockwise (CW) or counter-clockwise (CCW) on their tip, slow down due to friction, then topple over and tumble to settle with one side up. Data was collected by students from commercially available toy dreidels. A hypothesis test (χ^2 goodness of fit to a uniform distribution) shows the dreidels are unfair. A second hypothesis test (comparing the observed CW and CCW frequencies) shows that all the tested dreidels depend on the spin direction. An ordinary differential equation (ODE) model based on rigid body dynamics and dry friction is developed to describe the spin and initial fall of the top. This model explains the surprising sensitivity to the tip position and shape and the dependence on the spin direction. Finally a phase space analysis of the ODE system predicts the probability distributions (CW and CCW) for a given spinner-surface combination. (Received August 14, 2007)