**Section 9.3: Conditions for the Logistic Model**

* Conditions for the Logistic Model
  + **Linearity**: The logits (log odds) should have a linear relationship with the predictor.
    - Binary predictor: automatically met
    - Categorical predictor: automatically met
    - Numerical predictor: plot log(odds) vs. predictor (x)

🡪 You can transform x to achieve linearity!

* + **Random/Representative**: Is it reasonable to think of a “spinner” underlying this process?
  + **Independence**: No pairing or clustering of units.  
    Time, Space, Yes/No
  + **~~Normality~~**: This *does not apply*! The responses are 0/1.
  + **~~Constant variance~~**: Also *does not apply*! In fact, variability in *Y* is highest when *π* is near ½ and lowest when *π* is near 0 or 1.
* Examples:
  + Major by class year
    - Linearity: no! 🡪 Logistic model not appropriate. STOP.
  + Trashball by gender
    - Linearity: automatic since predictor (gender) is binary
    - Random/Representative: The outcome is not random, but success is based on a result of forces “so numerous and subtle that we can apply a probability model”.
    - Independence: Probably not. My shot is independent from yours, but each student appears multiple times in the data set, and always under the same gender…so outcomes are “clustered”.
  + Trashball by distance
    - Linearity: looks good (based on empirical logit plot)
    - Random/Representative: The outcome is not random, but success is based on a result of forces “so numerous and subtle that we can apply a probability model”.
    - Independent: My shot is independent from yours. Students had one shot at each distance.
  + Titanic: survival by class (1st, 2nd, 3rd, crew)
    - Linearity: automatic since predictor (class) is categorical
    - Random/Representative: Is there a “random process” underlying this process?
    - Independence: Absolutely not. Many passengers on the Titanic were related to each other If a mother survived, her children were likely to be with her, and vice versa. In addition, since there were not enough lifeboats for everyone, if you get in a lifeboat, that means I am *less* likely to get in one: our outcomes are not independent.