**Research Question**

What understandings of rate of change do middle school students demonstrate through engagement with function carnival?

### Results

**Cannon Man**
- Straight Line: 0%
- Pointed Symmetric: 37%
- Pointed Skewed: 14%
- Curved: 19%

**Cars**
- Straight Line: 32%
- Normal Incline: 23%
- Curved: 14%

**Data Collection**
- 7 seventh grade classrooms in the southeastern U.S.
- Students worked in pairs on Function Carnival
- A total of 22 pairs of students completed the task
- Worksheets, screen recordings, and audio were collected for each pair
- For each screen cast, we created a narrative that included a chronological record of the students’ engagement with the task that included a transcript as well.

**Analysis**
- For each type of data, a codebook was developed.
- All data was coded by two researchers. Disagreements were discussed and discrepancies were resolved.
- Initial graphs
- We coded each graph for the shape of the graph
- Narratives
- We coded for elements of rate of change they demonstrated

**Implications**
- No students demonstrated a vertical line for the movement of the cannon man, which majority of teachers expected.
- Students were not able to initially represent the change in speed of the cannon man on the descent.
- After trials, 20% of students realized that the point of the graph needed to be curved instead of pointed, and 20% of students realized that the shape of the line changed when the cannon man’s parachute opened.

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**Cars**
- Unlike cannon man, 14% of the students initially drew the shape of the track rather than the movement of the car.
- Initially none of the students were able to represent the car crashing.
- Majority of the students figured out that the shape or steepness of the line affected the speed of the car.
- However, 13% of the students realized that the straight line means the car would stop because distance does not change as time continues.