Beanbag Toss
Learning Goals

Grade Band	6 – 8
Possible Math Tools	• Percentages • Functions • Probability distributions
Real-World Context	Students divide into groups, and each group designs a beanbag toss game. The game must be fair enough to attract players, and challenging enough to keep them invested. Students use the resources at their disposal to design a carnival game, and use data to set an appropriate level of challenge by changing player accuracy. Students may brainstorm one of many different modeling problems: • How big should the target be? • How far should a player stand from the target? • What kind of obstacles should be in the way?
Cross-Curricular Connections	This lesson could be inspired by a field trip or icebreaking game; for example, students might create a carnival stand as a crafts project, and then consider how to improve their game.

Relevant Common Core Standards:

CCSS.MATH.CONTENT.6.SP.A.1
Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*
Task: Prepare statistical questions to determine the accuracy of the average player playing each variant of the beanbag toss game.

CCSS.MATH.CONTENT.6.SP.A.3
Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
Task: Describe the accuracy of a set of parameters for the beanbag toss (i.e. with a target of size X and a person Y meters away) as a statistical grouping (the mean accuracy is Z with a standard deviation of W).

CCSS.MATH.CONTENT.6.SP.B.4
Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
Task: Graph the accuracy of beanbag tosses in order to compare data visually and determine which parameters make the game both fair and challenging.

CCSS.MATH.CONTENT.6.SP.B.5
Summarize numerical data sets in relation to their context.
Task: Interpret what the collected data means in terms of the beanbag toss game.

CCSS.MATH.CONTENT.7.SP.C.5

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Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Task: Calculate the probability of hitting the target in each version of the beanbag toss game.