Beanbag Toss
Learning Goals

<table>
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<th>Grade Band</th>
<th>6 – 8</th>
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| 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.