

Trash Can Probability



Directions:

Your group will make a trash ball from 1-2 sheets of paper. You will be given meter sticks or measuring tapes and a “basket”. Each student will get three attempts to shoot their trash ball into the basket from EACH distance listed below. Note that your eyes must be **CLOSED** when shooting from 6 meters. Before you shoot, use the words impossible, unlikely, likely or certain to predict how likely it is that you will make all three baskets from each distance. Record your group results below.

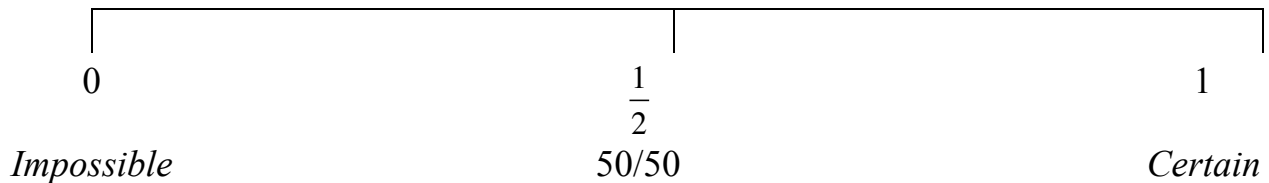
STUDENT Data Sheet

Distance	Prediction	Total Number of Tosses In	Total Number of Tosses	Ratio (Number in to Total attempts)
3 cm				
150 cm				
250 cm				
350 cm				
6 m (eyes closed)				

Analysis:

After the teacher collects and displays the Class Data, complete the following questions.

- Looking at the class data, decide what you think the probability of making a basket from each distance would be and then place and label a point on the number line to represent this.



2. List your probability for making a basket from each distance as a fraction, decimal and percent below.

Distance	Probability as a Fraction	Probability as a Decimal	Probability as a Percent
3 cm			
150 cm			
250 cm			
350 cm			
6 m (eyes closed)			

3. Describe a scenario where the probability of success would be 0 or impossible.

4. Describe a scenario where the probability of success would be 1 or certain.

5. What is probability?



Teacher Directions

Objective

By attempting to make baskets from differing distances and analyzing data on results, students will begin to understand the concept of chance and quantify the likelihood of an event using a value from 0 to 1.

Prior Knowledge

- Students should be able to represent a part of a whole or a part of a set using fractions.
- Student should be able to place $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ correctly on a number line.
- Students should have had experience using a metric ruler.

Materials and Equipment

- Sheets of scrap paper or recycled paper – all the same size
- Trashcans or other large containers (buckets work well)
- Metric tape measures or meter sticks
- Masking tape
- Sidewalk chalk if outdoors – post-it notes if indoors

Engage

Ask students if they have ever crumpled up a piece of paper and aimed it at a trashcan. Did their tosses go in? Ask, “Can we predict whether or not a toss will go in the trash can?” Ask, “Do tosses go in every time? Why not?” Introduce the idea that it is NEVER *certain* that a toss will go in, but it may be *likely* to go in. Continue by stating that other tosses may or may not go in, while there are tosses that are unlikely to land in the trashcan or that cannot possibly land in it (for example, the if ball is larger than the can or the can has no opening).

Write the terms on the board and ask students what each word means to them.
Certain, likely, equally likely, unlikely, impossible.

Explain to students that students will be experimenting to determine the likelihood of a paper toss landing in a container, and we will be using these terms to analyze our tosses.

Explore

Divide students into equal groups of 3 (if possible) and give each group their materials and equipment. Students will make tosses from the following distances to the trashcan: 3 cm, 150 cm, 250 cm, and 6 m. Tell students that on the 6-meter toss, they will close their eyes while tossing!

Students will first measure and mark the distances before tossing. *Before* tossing, students will *predict* the likelihood of their tosses on their paper. After they have made their predictions, students can begin tossing and recording. Each student will toss a crumpled piece of paper three times from each distance and record the number of tosses that land in the basket. The final toss is with eyes closed.



Explain

Once tossing is completed, combine the class data on a chart. Discuss the data. The goal is to help students agree on descriptors for each likelihood and to notice the relationship between attempts and successes from each distance.

CLASS Data Sheet

Distance	Total Number of Tosses In	Total Number of Tosses	Ratio: Tosses in to total attempts
3 cm			
150 cm			
250 cm			
350 cm			
6 m (eyes closed)			

Draw a long line segment on the board and label it as shown below:



Explain that this is the probability line and we use it to quantify the likelihood of events. Probability is a number that indicates how likely something is to occur. Events that are impossible are said to have a likelihood of zero, and events that are certain are said to have a likelihood of 1. Ask student where they would place 50-50. Ask them where they would place likely or unlikely?

Mathematical Notes:

An event that is *certain* is one in which the probability is 100% or 1. An event that is *impossible*, on the other hand is 0% or 0. The term 50-50 is sometimes used to an event equally may or may not occur (*equally likely*), 50%, .5 or $\frac{1}{2}$. If an event is *likely* or *unlikely*,

it does not have a specific numerical values associated it, but is always between 0 and 1. Likely describes an event that has a probability between 1 and .5 (100% - 50%), while unlikely describes an event that has a probability between 0 and .5 (0 – 50%).

Analysis

Have the students complete the analysis section of the student page individually. Give them a few minutes to compare answers and then use round table or do a whole class share out to discuss the final 3 questions.

