

# Mathematical Explanations for the X/O Card Problem

*You can add up the total Xs and total Os so we can compare our results.*

*(Hopefully) Our experimental data suggests that you are twice as likely to have an X on the other side as an O, or that the probability of having an X on the other side is two out of three.*

*We also want children to build mathematical tools that enable them to solve probability problems. In a previous session we looked at using a table or array to determine the probability of rolling ones when two dice are rolled. We used the array model to determine the sample space and then the likelihood of each outcome.*

*Determining your sample space is a big idea related to probability. Let's look at a model for determining the sample space of the X/O card problem.*

*First, label the three cards, so that we can determine and talk about each possible event. We can label the X/X card as X1 and X2, the X/O card as X3 and O1, and the O/O card as O2 and O3.*

Card X/X		Card X/O		Card O/O	
X1	X2	X3	O1	O2	O3

*Now, list all the possible outcomes for when we reach into the bag. Next, consider only the outcomes we are interested in—when you are looking at an X on a drawn card. Thus, two out of three times an X will be on the other side.*

*There is another way to look at this that is more holistic. Two of the three cards have the same symbol on both sides. Thus, two out of three times, when you reach in a bag and pull out a card, the other side of the card will have the same symbol as the one you are looking at.*

*Probability notions are especially important to understand because situations that involve probability are often counterintuitive. That is, if we follow our instinct, we are often wrong. It is important that we learn how to mathematize these situations. When we are unable to do so, we are unable to use mathematics to make sense of the world around us.*