Materials Needed
- ○ 3 same-sized plastic bottle caps (e.g.: plastic water bottle caps, juice caps, plastic soda caps, etc.)
- ○ Tape
- ○ Permanent markers

Grade Range
K-2
3-5

Topics/Skills
Probability; Statistics, Reasoning; Strategy

Learning Standards
CCSS: Mathematical Practice
NGSS: Motion and Stability
NGSS: Engineering Design

Duration
20 – 30 minutes

Prep Time
10 minutes

Players
1+ (2+ recommended)

Bottle Cap Flipper
Heads or Tails 2.0

Heads or Tails? In this game, players will design a bottle cap flipper that has five sides with different shapes and symbols on each side. Players will make predictions, take turns flipping their homemade flipper and strategize to win the final round.

Activity Challenge
Design a flipper using bottle caps and play a game of Bottle Cap Flipper.

Objective
Predict which side that the flipper will land on the most.

Preparation
1. Gather materials and select workspace. Workspace should have a smooth surface, such as a table, countertop or floor.
2. Make a chart to record player predictions and to tally the flips. See, or use, the sample chart on the next page.
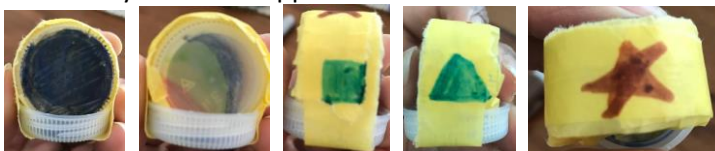
Assembly
1.
Place two bottle caps together rim to rim. Wrap tape around the sides.

2.
Tape the two caps to the third bottle cap as shown. There will be a total of five ways that the flipper can land.

3.
Draw on each side of the bottle cap flipper, that can land upright when thrown, a different symbol or color (e.g., moon, clouds, flower, peace, rainbow, apple, triangle)

How to Play

1. Each round has 10 flips. At the beginning of each round, each player predicts which side of the flipper will be on top the most out of the 10 flips. Write each player's name in the appropriate box.
2. During each round, players take turn flipping the flipper from youngest to oldest.
3. Round 4 is the final round. The player who predicted the side that gets the most flips for them, wins the game!

Observations

1. Which side is the flipper landing on the most? Why is it landing on this side the most?
2. How do weight and gravity influence how the flipper is landing?
3. Does the way a player flips the flipper determine how the flipper lands? How?

Extensions

- Create a flipper with four or more bottle caps.
- Create a flipper that will land with the same side up every time you flip it.
- Have each symbol (side) represent something (e.g.: square = 25 jumping jacks or rainbow = 10 pushups, etc.) Flip the flipper and whatever symbol is on top is what the whole group must do.
- Create a new game using the same flipper created in this activity. Write new rules and new objectives.

Content Behind the Activity

Probability is the likelihood, from 0 to 100% (percent) that something will happen. Probability can also be expressed as a set number of **chances** out of a total number, 1 chance out of 6, for example.

Objects are in a **stable** position if they do not tip over when lightly touched.

A coin can be balanced on the narrow edge, but if touched will tip over and land with either "heads" or "tails" on top. A tossed coin can thus land in one of two stable positions. Both are equally likely so the probability is 50% that the coin will land with the heads side upward. A **die** (half of a pair of dice) has 6 sides and is **symmetrical**, can be turned a certain amount (less than a full turn) and still look the same. A tossed die can land with any one of the six sides on top. Each side of the die has a 1 in 6 chance of being on top.

The **asymmetrical** (not symmetrical) shape of the flipper means there are 5 orientations that the flipper can be in when the tumbling stops. The asymmetrical shape also means the 5 different landing orientations are not all equally likely to occur over multiple tosses. How the flipper is tossed and how it first lands can also affect which side eventually ends up on top.

	Side 1:	Side 2:	Side 3:	Side 4:	Side 5:
example: Round 1	*Fred* *III*	*Stacey*	*Mary* *IIII*	*Tony* *I*	*Leticia* *II*
Round 1					
Round 2					
Round 3					
Round 4 **FINAL ROUND!**					