Let's Make an Educated Guess

To stay or to switch—that is the question!

For years, the Monty Hall Problem has been debated and examined:

There are three doors. Behind two doors are goats (bad prizes) and behind one door is a car (good prize). You are told to choose one of the doors (the one you think has the car). Knowing where the prizes are, Monty opens a door that is not your door and that does not have the car behind it. He then asks you if you would like to switch from the door you originally chose to the other door that is not open.

Do you switch? Do you NOT switch? Or is it a 50/50 chance either way?

WHY CLUB LEADERS AND KIDS LOVE IT

- This activity was introduced in our 2013-2014 *Club Activity Book* and has been one of our most popular activities!

MATERIALS NEEDED

- 3 numbered "doors" (actually cups) for each group
- 2 bad prizes (e.g. bingo tokens) and 1 good prize (e.g. eraser) for each group
- The Win or Lose Tally Sheet
- Computers with Internet access (optional)

HERE'S HOW IT WORKS

Many students will not be familiar with the popular television game show *Let's Make a Deal*. So before you begin delving into the math behind the game, it is important that students fully understand the scenario above. Perhaps play a few rounds of the game by calling up different students to play.

Using three doors (three plastic cups), two bad prizes (two bingo tokens) and one good prize (an eraser), have a student play the game with you acting as Monty Hall...

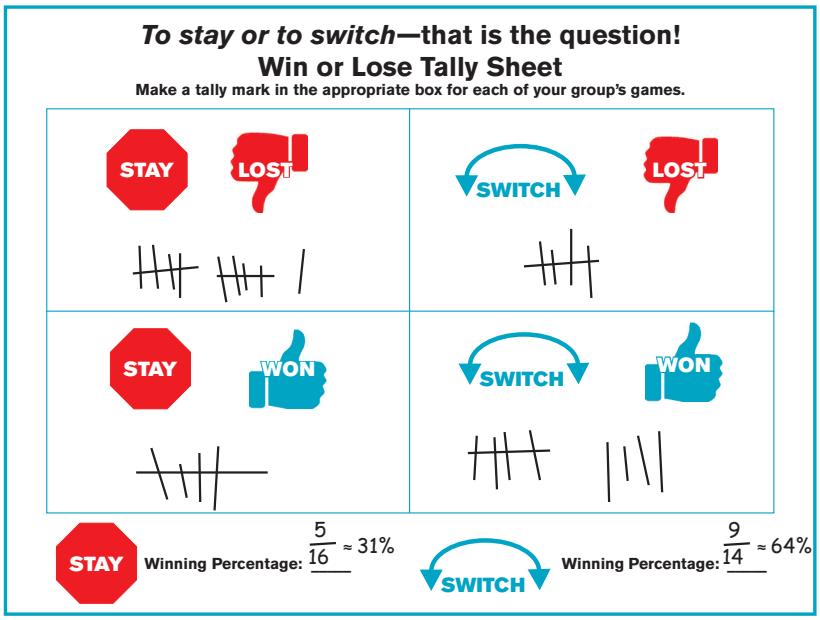
1. Place the eraser under a cup, but don't let the student know which cup. Suppose you put the eraser under cup 3.
2. Ask the student to choose a cup. Suppose she chooses cup 1.
3. You show what cup 2 was hiding (cup 2 is one of the cups that hid a bingo token and is not the cup that the student chose).
4. You ask the student if she wants to stick with her original choice or switch.
5. Then you reveal what is under the cup the student finally chose, and you see whether the prize won was the bingo token or the eraser.

After playing the game a few times, pose this question to your students: ***Do you think the player should make the switch when it is offered?*** Take a poll to track the number of students who say "Yes, the player should switch," "No, the player should not switch" or "It's a 50/50 chance at that point."

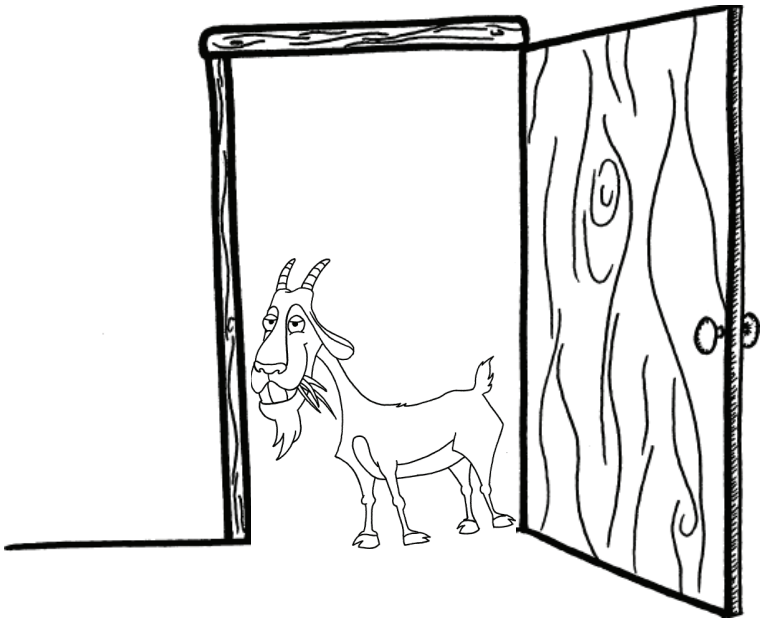
Without further discussing the question, divide the students into groups of three or four, and have them play the game 30 times (varying who is Monty and who is the contestant), and have them record the outcomes on their Win or Lose Tally Sheet.

Once each group has had a chance to finish, compile the results for every group onto one Win or Lose Tally Sheet. What does the data suggest?

If there are not enough students to provide a good sample size, you can use online simulators to show your students a large set of results.



It seems the thing to do is to switch. But why? Perhaps your students will be able to articulate a rationale for this. One way to explain it is that there is a ⅓ chance that the car is behind door number 1 and a ⅔ chance that the car is behind door 2 or door 3. After it is revealed that door number 2 has a goat behind it, there is still a ⅓ chance that the car is behind door number 1 and a ⅔ chance that the car is behind door 2 or 3. Since we know door 2 conceals a goat, there is now a ⅔ chance that door 3 conceals the car. A ⅔ chance is greater than a ⅓ chance, so the best decision is to switch.



To stay or to switch—that is the question!
Win or Lose Tally Sheet

Make a tally mark in the appropriate box for each of your group's games.

STAY LOST	SWITCH LOST
STAY WON	SWITCH WON

STAY **Winning Percentage:** ____ SWITCH **Winning Percentage:** ____

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