

Switch or Stick?

6692

Introduction

In this activity, students will simulate a popular game to find experimental probabilities.

Grades 6-8

NCTM Data Analysis and Probability Standards

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them
- Formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population

Files/Materials Needed

Files: *cardgame.act*

Materials: Playing Cards

PART 1 REVIEW THE OBJECT OF THE GAME

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Tell students that they will work in pairs in an attempt to determine the best strategy for the following game:

- Player 1 (the game show host) arranges three playing cards on a desk without revealing their identity to Player 2 (the contestant). The winning card is the card that has a color different than the other two cards. Player 1 should know which card is the winning card.
- Player 2 points to one card as his guess for the winning card.
- Player 1 will flip over one of the remaining two cards that is *not* a winning card.
- Player 2 has a choice of sticking with his original guess or switching to the other card that has not been turned over.

Explain to students that this game has created considerable debate as to which strategy is better. The theoretical probability can be difficult to determine and, therefore, it makes sense to conduct an experiment, gather the results, and analyze them in such a way that the best strategy can be seen.

Each pair of students will play this game several times, making sure that they use each strategy the same number of times (for example, if a pair of students plays the game 20 times, they should use the 'Switch' strategy 10 times and the 'Stick' strategy 10 times). Using the following designations, the appropriate numbers will be recorded in a list.

- 1: Switched and won
- 2: Switched and lost
- 3: Stuck and won
- 4: Stuck and lost

PART 2 PLAY THE GAME

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- a. Launch TI-Navigator™ on the computer and start the session.
- b. Have each student log into NavNet on their calculator.

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- Load the **cardgame.act** activity settings file into Activity Center. This sets up the Activity Center so that students have a list on their calculator.
- Each pair of students should now play the game 20 times and send their results to Activity Center.
- Stop the activity and click **Configure** and select the **Existing activity lists** check box. By starting the activity again, each student will receive the entire class data set.
- Have students press **[2nd][QUIT]** and exit NavNet before working on Part III.

PART 2 DISPLAY THE DATA AND DRAW A CONCLUSION

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- Instruct students to create a statistical display of the data on their calculators. Since they want to tally the results of each strategy, it makes sense to create a histogram with intervals of width one.
- Use **Screen Capture** to view student results and ask students if they can see the best strategy for winning the game. If students are unsure, instruct them to use the **[TRACE]** key to see the number of occurrences of each outcome. Remember that a 1 corresponds to “Switched and won”, a 2 corresponds to “Switched and lost”, etc...
- You may also choose to display the histogram in Activity Center by clicking on the **Frequency Plot** icon.

EXTENSION

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Have students use their results to make an educated guess as to the theoretical probabilities for each strategy.

The “Stuck” strategy has a $\frac{1}{3}$ chance of winning and a $\frac{2}{3}$ chance of losing. The “Switch” strategy has a $\frac{2}{3}$ chance of winning and a $\frac{1}{3}$ chance of losing and therefore is the best approach when playing the game.

As an additional extension, have students collect data on certain characteristics of consumer products. For example, students could collect data on the life expectancy of a variety of batteries and their cost, display the data in a meaningful way, and draw a conclusion as to which batteries are the best value. Student data can be submitted in list form, aggregated, and sent back down to each student calculator for analysis.