

Switch or Stick?

ID: 12411

Time required

45 minutes

Activity Overview

In this activity, students will simulate a popular game to find experimental probabilities and determine which is the best strategy by creating a histogram.

Topic: Numbers and Operations

- *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*

Teacher Preparation and Notes

- *TI-Navigator is not required for this activity, but an extension is given for those teachers that would like to use it.*
- *Prior experience with creating lists and histograms would be helpful, though not necessary.*
- *Students will need a set of cards, such as a deck of playing cards, which have two different colors.*
- ***To download the student worksheet and TI-Navigator files, go to education.ti.com/exchange and enter “12411” in the quick search box.***

Associated Materials

- *MGAct24_Probability_worksheet_TI73.doc*
- *MGAct24_Nav_TI73.act*

Suggested Related Activities

To download the activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Switch or Stick (TI-73 Explorer and TI-Navigator) — 6692*
- *Getting Started with the Probability Simulations App (TI-73 Explorer) — 6698*
- *The Birthday Problem (TI-73 Explorer) — 6814*

Problem 1 – Gathering the Data

Explain the rules of the game to students. They are to try to determine the best strategy to win the most often in 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 and 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

Questions 1-3

Ensure students understand the rules of the game and how they are to play. Encourage discussion about their predictions.

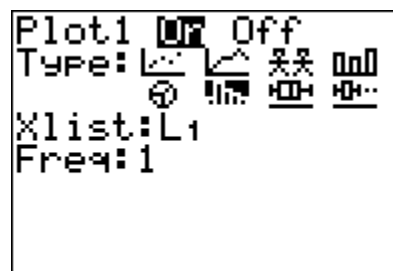
Monitor students as they gather data and play the game. Make sure it’s clear that they should record a 1, 2, 3, or 4 for each outcome.

L1	L2	L3	3
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L1()=			

Problem 2 – Graph the Data

Question 4

After students have collected their data for game 1 (20 rounds), they should set up a histogram. Press **2nd** **Y=** **ENTER** to access Plot 1. Use the arrow keys and **ENTER** to set up the plots shown at the right. Then press **ZOOM** and select **ZoomStat**. To ensure that each bar has a width of 1, press **WINDOW** and change Xscl to 1.



Questions 5-6

Allow students time to discuss and think about how their data and graph compare to their original predictions. To move through each bar of the histogram, students can press TRACE and use the arrow keys.

Question 7

Students should repeat playing the game (perhaps changing roles) and record data again. The data should be added to L1 and then graphed.

Problem 3 – Compare to Another GroupQuestions 8-10

Students in two groups should compare their data. Comparing data allows students to see that other groups received similar results and will help them draw conclusions at a higher level.

Extension

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 strategy.

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 values. Student data can be submitted in list form, aggregated, and sent back down to each student calculator for analysis.

Solutions – student worksheetProblem 1

1. Answers will vary. Check students' work.
2. Data will vary. The "Switched and Won" category (4) should have the largest number of data points.
3. Students should indicate that their results should be similar to other groups in the class. If students do not realize this early in the activity, later questions should help clarify this idea.

Problem 2

4. Check students' work. The graph should reflect the data gathered in Question 2.
5. Students should begin to see that the "Switch and Win" category has the most outcomes.
6. Switch and Win; See students' explanations.
7. Check students' work. The graph should reflect the additional data gathered.

Problem 3

8. Students should realize that the data are similar and the outcomes are similar.
9. Answers will vary. Accept reasonable responses.
10. Answers will vary. Explanations should be consistent with students' answers to Question 1.

Extension – TI-Navigator™

1. Use **Screen Capture** to monitor student progress or to share one group's work with the class. Use **Quick Poll** to ask questions as students work through the activity.
2. Load the **MGWeek24_Nav_T173.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.

Using the Activity Center file will allow for each group to play the game one round. Combining all groups work will provide many more data points for consideration.