

Simulation & Experimental Probability

Lesson objectives

- recognize and describe how probabilities are used to represent the likelihood of a result of an experiment and the likelihood of a real-world event
- determine, through investigation using class-generated data and technology-based simulation models the tendency of experimental probability to approach theoretical

1.1

Lesson objectives

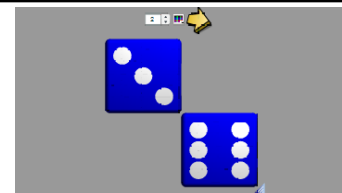
Teachers' notes

Lesson notes

Introduction to Simulations & Experimental Probability

Key Terms Required

- 1 →
- 2 →
- 3 →
- 4 →
- 5 →
- 6 →



Let's consider these terms and the concept of experimental probability in the context of a simple game.

E.g., The Coffee Game

"Suppose each morning you play a simple game with a friend to determine who pays for coffee. Your friend tosses a coin and you call it. If you are right, your friend pays \$2.00 (\$1.00 for each cup of coffee); otherwise, you pay." (Nelson, p203)

A. Match-it

Use the checker tool below to match each term to one of the descriptions provided to the right.

Term: **event**

>> Drag text here

>> Drag text here

>> Drag text here

toss of a coin

heads or tails

getting your call on the toss of a coin

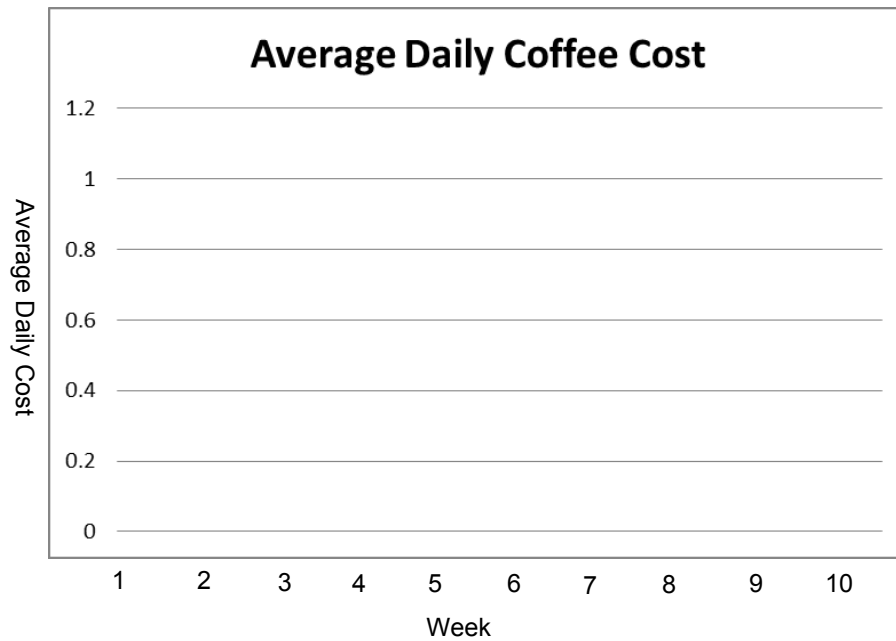
B. Investigation

- Turn to p203 of your textbook
 - > Read the purpose of the investigation
 - > Follow the procedure and complete parts A to E
 - You may use the table below to record your results
 - A grid for graphing has been provided for part E
 - > Answer the discussion questions on p204



Week	Wins	Losses	Weekly Cost	Accumulated Cost	Avg Daily Cost
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Part E



- Since the daily coffee cost is randomly determined and is a quantity, it is called a **random variable**.
- Given that there are only two possible values (\$0 and \$2), the variable is a **discrete random variable**.
- It seems reasonable that the **expected value** (average of values of the random variable) for the daily coffee cost would be \$1.00--i.e., since you should have an equally likely chance of winning or losing.

Discussion Questions, p204

1. Based on the results, is this a *fair game*?
2. How many trials would be required before the expected weekly cost could be predicted with confidence?
3. a) Would the game be fair if you had to guess the result on rolling a six-sided die?
b) How much would you expect to pay each day? How much would you partner expect to pay?



3b)

Validate Investigation 1

- In order to validate the results of the first investigation (i.e., increase confidence with making weekly predictions), a larger number of trials are required.
- In this part of the investigation, you will be altering the procedure for Part 1 in two ways: increasing the number of trials (weeks) to 30 and completing a table and graph using spreadsheet software (MS-Excel).
 - > Posted for download from the course website (Unit 1), a tutorial has been created to help you learn how to use a spreadsheet for conducting a simulation.
 - > Watch the video and try to perform the simulation using Microsoft Excel.
 - > Once you've completed the simulation, show your teacher your completed spreadsheet document, and then answer the discussion questions on p206 (#1 and #2). Your spreadsheet is to be printed out and answers attached for handing in.

Discussion Questions

1. After 30 weeks, use your results to estimate the fraction of the daily trials that you
 - a) win
 - b) lose
2. Use your simulation results to estimate the following:
 - a) the probability that you will have to buy coffee at some point during the week
 - b) the probability that you won't have to buy coffee at all in a week
 - c) your expected daily coffee cost
 - d) your expected weekly coffee cost

Simulations ContinuedE.g., 2. **The Cereal Box Problem**

A cereal company, for a limited time, is offering consumers the chance of getting a furbikawitz (small, plush toy)--one in each box of cereal that is purchased.

There are 6, different furbikawitzes.

Problem: What is the expected number of boxes that must be purchased in order to get all 6 of the toys?

Your Task:

- With a partner, design and carry out a die-rolling simulation that can be used to determine the expected number of cereal boxes that are required for purchasing. Try to use some of the key terms presented in this section when answering.
- Decide if your simulation is *fair* (explain why or why not).
- Explain how you could test the validity of your simulation.
- Time and resources permitting, your teacher may ask you to perform a validity test.

Attachments

Coffee Game_Investigation 1_Coin Simulation_Feb 5_2013.xlsx

Coffee Game_Procedure 2_Coin Simulation w TI_Feb 5_2013.xlsx