Lab 6a: Probability Basics

Stat 131A, Spring 2019

Learning Objectives:

- General introduction to probability:
- probability as a numerical measure between 0 and 1.
- probability describes the likelihood that an event will occur.
- Begin assigning probabilities to events.

General Instructions

- Write your solutions in an `Rmd` (R markdown) file.
- Name this file as `lab06a-first-last.Rmd`, where `first` and `last` are your first and last names (e.g. `lab06a-gaston-sanchez.Rmd`).
- Knit your `Rmd` file as an html document (default option).
- Submit your `Rmd` and `html` files to bCourses, in the corresponding lab assignment.

Problem 1

Probability is a measure of how likely an event is to occur. Given the following probability values, choose the probability that best matches each of the following statements:

```
0      0.01      0.3      0.6      0.99      1
```

a) This event is impossible:

b) This event will occur more often than not, but is not extremely likely:

c) This event is extremely unlikely, but it will occur once in a while in a long sequence of trials:

d) This event will occur for sure:

Problem 2

From the following numbers, indicate those that could NOT possibly be probabilities.

a. 0.462

b. -0.201

c. 0

d. 1

e. 6/5

f. 3.5

g. 110%

h. 999.9999 / 1000

Problem 3

This data represents the responses of 200 community college students. The variable is "the number of credit cards" the students had.

Num of credit cards	Probability
0	0.61
1	0.20
2	0.14
3	0.01
4	0.01
5	0.03

a. What is the probability that a student has one credit card?

b. What is the probability that a student has at least one credit card?

c. What is the probability that a student has at most 4 credit cards?

d. What is the probability that a student has more than 4 credit cards?

e. What is the probability that a student has more than one credit card?

Problem 4

A computer program is programmed to calculate various chances. Match the numerical answers with the verbal description (which may be used more than once).

Numerical answer	Verbal description
a) -50%	i) This is as likely to happen as not
b) 0%	ii) This is very likely to happen, but it's not certain
c) 10%	iii) This won't happen
d) 50%	iv) This may happen, but it's not likely
e) 90%	v) This will happen, for sure
f) 100%	vi) There's a bug in the program
g) 200%	

Problem 5

A box contains three balls: one red, one blue, and one yellow. Consider an experiment that consists of withdrawing a ball from the box, replacing it, and withdrawing a second ball.

a. List the *Sample Space* (SS), that is, list all possible outcomes of this experiment.

b. What outcomes form the event that the first ball drawn is yellow?

c. What outcomes form the event that the same ball is drawn twice?

Problem 6

Repeat the previous problem but now consider that the second ball is drawn without replacement of the first ball.

a. List the *Sample Space* (SS), that is, list all possible outcomes of this experiment.

b. What outcomes form the event that the first ball drawn is yellow?

c. What outcomes form the event that the same ball is drawn twice?

Problem 7

A bowl contains 12 poker chips: 3 red, 4 white, and 5 blue. If one of these poker chips is selected at random from the bowl, what is the probability that its color is

a. red?

b. red or white?

c. not white?

Problem 8

Consider the experiment of tossing a fair coin 3 times. For each coin toss, the possible outcomes are heads or tails.

a. List the equally likely events of the sample space for the 3 tosses.

b. What is the probability that all three coin tosses come up heads?

c. What is the probability that all three coin tosses come up tails?

d. What is the probability that at least one toss comes up heads?

e. What is the probability that at least one toss comes up tails?

Problem 9

A Harris Poll indicated that of those adults who drive and have a cell phone, the probability that a driver between the ages of 18 and 24 sends or reads text messages is 0.51. Can this probability be applied to all drivers with cell phones? Explain.

Problem 10

According to a recent poll of adults with pets, the probability that the pet owner cooks especially for the pet either frequently or occasionally is 0.24.

From this informaiton, can we conclude that the probability a male owner cooks for the pet is the same as for a female owner? Explain.

Problem 11

What is the probability that a day of the week selected at random will be:

a. A Wednesday?

b. A Tuesday?

c. A Wednesday *or* a Tuesday?

d. A Wednesday *and* a Tuesday?

Problem 12

An investment opportunity boasts that the chance of doubling your money in 3 years is 95%. However, when you research the details of the investment, you estimate that there is a 3% chance that you could lose the entire investment. Based on this information, are you certain to make money on this investment? Are there risks in this investment opportunity?

Problem 13

Can you wiggle your ears? Use the students in your lab section to estimate the percentage of people who can wiggle their ears. How can your result be thought of as an estimate for the probability that a person chosen at random can wiggle his or her ears? *Note: National statistics indicate that about 13% of Americans can wiggle their ears*

Problem 14

Consider rolling a fair die and counting the number of dots on top.

a. What are the possible outcomes? Are the outcomes equally likely?

b. Assign probabilities to the outcomes of part (a). Do the probabilities add up to 1? Should they add up to 1? Explain.

c. What is the probability of getting a number less than 5 on a single throw?

d. What is the probability of getting 5 or 6 on a single throw?

Problem 15

Two tickets are drawn at random without replacement from the box: `[1 2 3 4]`.

a. What is the chance that the first ticket is 3?

b. What is the chance that the first ticket is an even number?

c. What is the chance that the second ticket is 3?

d. What is the chance that the second ticket is 3, given the first is 2?