

Quiz 2

STAT 109: Introductory Biostatistics

Quiz 2

Topics:

- Basic R syntax (from Lab 1)
 - Counts, proportions, and percentages (from Lecture 2)
 - Probability language and definitions (from Lecture 2)
-

Instructions

- This quiz will be graded on correctness during the first twenty minutes of our Thursday lab.
 - You may not use notes, the internet, or a peer.
 - For R questions, **write** by hand valid R code exactly as you would type it in R.
-

Part A: R Syntax and Computing Basics

Write **valid R code** for each question by hand.

1. Arithmetic in R

Write a single line of R code that produces the value **10** by adding two numbers.

2. Multiplication in R

Write a single line of R code that produces the value **6** by multiplying two numbers.

3. Assignment and functions

Write R code that: 1. assigns the value **16** to a variable named **x**, and
2. computes the square root of **x**.

4. Creating a vector

Write R code that creates a vector named **numbers** containing the values:
2, 4, 6, 8, 10

5. Indexing a vector

Using the vector **numbers** from Question 4, write R code that returns the **third element** of the vector.

6. Vector arithmetic

Using the vector `numbers`, write R code that creates a new vector called `numbers_plus_one` that adds **1** to every element of `numbers`.

7. Computing a summary

Write R code that computes the **mean** of the vector `numbers`.

8. Counting outcomes

Suppose the vector below stores the results of 6 coin flips:

```
flips <- c("H", "T", "H", "H", "T", "H")
```

Write R code that counts how many times "H" appears in the vector by using '`==`' and a second vector, `heads <- c("H", "H", "H", "H", "H", "H")`. Hint: use the `sum()` function and the fact that `TRUE` is equivalent to 1 and `FALSE` is equivalent to 0.

Part B: Counts, Proportions, and Percentages

A student flips a fair coin **20 times** and records the results.

They observe **9 heads**.

9. Counts

What is the value of: - x , the number of times the event “head” occurred?

- n , the total number of trials?

10. Proportion

Compute the **observed proportion** of heads, \hat{p} .

Show your calculation.

11. Percentage

Convert the observed proportion of heads into a **percentage**.

Part C: Probability Notation and Interpretation

12. Observed vs. theoretical probability

Using correct notation, clearly state: - the **observed proportion** of heads using \hat{p} - the **theoretical probability** of heads for a fair coin using $P(\text{head})$

13. Interpreting symbols

In one or two sentences, explain the difference between:

- \hat{p}
- $P(\text{event})$

Your answer should refer to **data** and **long-run behavior**.

Part D: Definitions

14. Definition of probability

State the definition of probability that involves: - a **repeatable random process**

- a **proportion**
- the idea that the process continues **forever**

You may write this in words.

15. Vocabulary

Give a clear definition of each term:

- a) **Sample space**
 - b) **Outcome**
 - c) **Event**
-

16. Identifying components

Consider rolling a single six-sided die.

- What is the **sample space**?
- Give one **outcome**.
- Give one **event**.